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MARYLAND WATER SUPPLY AND DEMAND STUDY

Part I
BASIC DATA

Volume 4
YOUGHIOGHENY RIVER BASIN

MARYLAND STATE PLANNING DEPARTMENT

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MARYLAND WATER SUPPLY AND DEMAND STUDY

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Part I - BASIC DATA

Volume 4 - YOUGHIOGHENY RIVER BASIN

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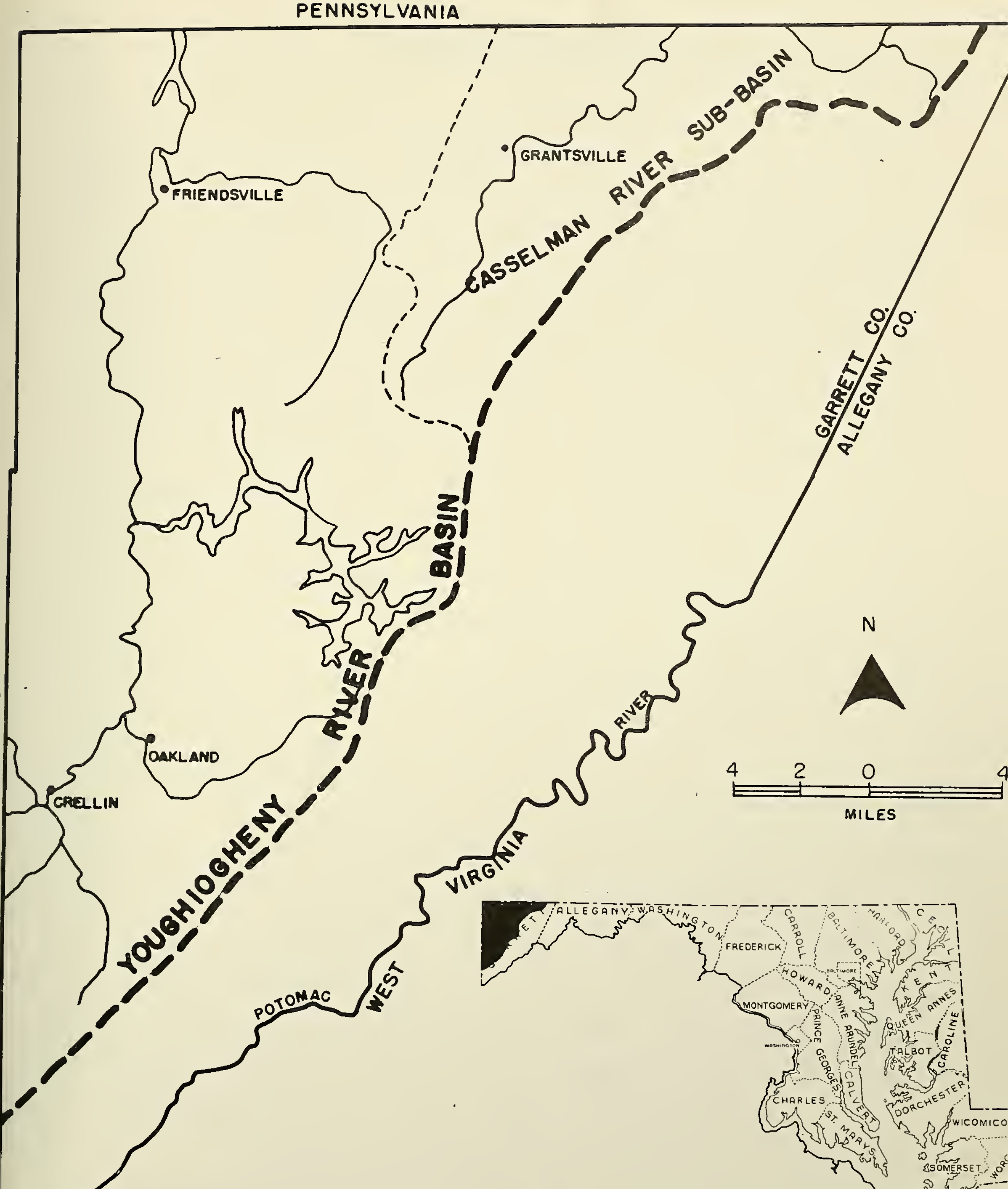
* Omitted in this report.



YOUGHIOGHENY RIVER BASIN

GARRETT COUNTY, MARYLAND

YOUGHIOGHENY RIVER BASIN

GENERAL DESCRIPTION

The Youghiogheny River, 134 miles in length and draining an area of 1,768 square miles, is the largest tributary of the Monongahela River system. The Youghiogheny River originates in the southwest corner of Garrett County, Maryland, near the West Virginia border, then meanders back and forth between the two states and finally re-enters Maryland at mile point (m.p.) 123 to flow through Garrett County in a northernly direction. An area of 419 square miles in Garrett County (about 63% of the County) is within the Youghiogheny basin. The river crosses into Pennsylvania at m.p. 86 and eventually enters the Monongahela River at McKeesport, about 71 river miles downstream from the State line. The Monongahela River continues downstream another 15 miles to Pittsburgh at which point it joins the Allegheny River to form the head of the Ohio River.

Physiography and Geology

The Youghiogheny River basin, westernmost in Maryland and separated from the Potomac drainage by Backbone Mountain, is long, narrow and irregular in shape. Lying within the Appalachian Plateau physiographic province, the basin is characterized as a broadly rolling upland deeply incised by stream valleys. Many sections of the river valley, however, are narrow and rugged with the river often flowing over rock ledges. From its source (Backbone Mountain - elevation 3,360 feet) to the Pennsylvania border (elevation 1,470 feet), the River has an average slope of 39 feet per mile.

Consolidated sedimentary rocks of Devonian, Mississippian and Pennsylvanian ages underlie Garrett County to known depths of several thousand feet. These were deposited in horizontal and parallel beds and were later buried, hardened and folded to form geologic structures known as anticlines and synclines. Major structures in the Youghiogheny basin area are the Deer Park anticline, Accident dome (a structure similar to an anticline), Casselman, Lower and Upper Youghiogheny synclines.

The physiography of Garrett County is chiefly the surface expression of the weathering and erosion effects on the rock strata comprising the various geologic structures. The hard and massive sandstones (Pottsville formation) form the high ridges, the softer shales (Greenbrier formation) which weather and erode easily form the narrow valleys, following the trend of the underlying geologic structures. Sands of the Pocono formation form the minor ridges and shales of the Devonian age and of Pennsylvanian coal erode in the form of low, rolling hills (Amsden, et al, 1954).

Major Sub-Basins in Maryland

The Casselman River sub-basin is the largest within the Maryland portion of the Youghiogheny drainage basin. The Casselman River drains an area of 97 square miles before crossing the Pennsylvania-Maryland line at m.p. 45.9 (two miles below Grantsville) and eventually joining the Youghiogheny at Confluence, Pennsylvania (m.p. 73 on the main stem of the Youghiogheny). Table 1 lists mileage points and drainage areas for the major tributaries of the Youghiogheny River in Maryland as well as significant points on the main stem. A complete listing of this information is found in Appendix A to this report.

Table 1. Mileage Points and Drainage Areas, Youghiogheny River and Maryland Tributaries

Location	M.P.	Drainage Area Total	 In Maryland
Youghiogheny River, head	134.2	0.0	0.0
Snowy Creek, mouth	118.7	33.6	2.6
Youghiogheny River, Crellin	118.55	89.3	
Little Youghiogheny River, mouth	114.3	40.5	40.5
Youghiogheny River, Oakland	114.25	133.9	
Deep Creek, mouth	106.0	66.6	66.6
Youghiogheny River, Sang Run	101.2	260.6	
Youghiogheny River, Friendsville Br.	91.8	297.6	
Bear Creek, mouth	91.0	50.5	50.5
Youghiogheny River, Md.-Pa. line	86.3	396.9	319.4*
Youghiogheny River, total main stem in Maryland			322.0*
Casselman River mouth, North Branch	53.5	25.2	25.2
Casselman River mouth, South Branch	53.5	20.3	20.3
Casselman River, head	53.5	45.5	45.5
Casselman River, Grantsville	48.1	62.5	62.5
Casselman River, Md.-Pa. line	45.9	68.7	65.4*
Casselman River, Confluence, Pa.	0.0	576.0	97.0*
Youghiogheny River, Confluence, Pa.	72.0	1,029.0	419.0
Youghiogheny River, mouth	0.0	1,768.0	419.0

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* Drainage areas at state line do not include tributaries draining a portion of Maryland but entering the Youghiogheny on the Casselman below the state line.

Population and Political Sub-divisions

Of an estimated 15,000 people living in the Maryland portion of the Youghiogheny basin as of 1960, about a third reside in incorporated areas. Oakland, located at the mouth of the Little Youghiogheny River, is the largest town with a population of 1,977. No other community has a resident population over a thousand (Mountain Lake Park - 975, Friendsville - 580, Loch Lynn Heights - 476, Grantsville - 446, Deer Park - 379, Accident - 237); however, several of these towns accommodate and provide services for large numbers of tourists using the many resource-oriented recreation facilities in the area.

Land Use

The major land uses of the basin area are as follows: forests - 50%, extensive agriculture - 35%, intensive agriculture - 10%, urban and other areas - 5%. The agricultural land is used primarily for dairying and fruit-raising while the forested areas are a major source of hardwood timber in the State. State forests, parks and wildlife management areas comprise a sizeable portion of the forest-classified land in the basin.

Although land uses are oriented largely to agriculture, forestry and recreation, less than a third of the working population is employed in these activities. The largest source of employment is provided by the manufacturing industries and wholesale and retail trade in the small towns. Manufacturing is limited largely to apparel and woodworking plants and food processing with a scattering of small plants in other industries. Coal mining, a major occupation through the First World War and again during World War II, now provides employment for less than 300 people in the entire Garrett County.

HYDROLOGY

Precipitation and Temperature

The Youghiogheny basin has a greater mean annual precipitation and a lower mean annual temperature (about 48 inches and 48°F, respectively) than any other major drainage area in the State. Heavy precipitation in the Youghiogheny basin occurs as snow in the winter months (averaging nearly 70 inches annually at Oakland) and during the period May-August in the form of frequent, heavy thunderstorms.

Table 2 lists annual precipitation and temperature for stations located in the basin.

Table 2. Average Annual Precipitation and Temperature in the Youghiogheny Basin

Station	Period of Record	Precipitation (inches)	Air Temperature (°F)
Bittinger	1954-60	45.3	47.1
Friendsville	1931-45	48.2	49.4
Grantsville	1951-60	39.5	—
Oakland	1899-60	47.3	47.8
Sines-Deep Creek	1930-60	48.9	47.4

Streamflow - Surface and Ground-Water Runoff

Streamflow measurements in the Maryland portion of the Youghiogheny basin are obtained from five stream gages operated by the U. S. Geological Survey. (In this report, streamflow is defined as total runoff which is the combined flow of both surface and ground-water runoff.) Table 3 lists the average and minimum daily flows of record for these stations. Also shown are probable low flows for two different design criteria: the 7-day, 10-year flow[1] and the daily flow which is exceeded 95 per cent of the time.[2] These design-flow criteria have been selected for presentation here only as examples of such criteria which have been used by regulatory agencies for purposes of stream water quality control.

An average streamflow value for the Youghiogheny basin in Maryland can be estimated by using the data from the Friendsville and Grantsville gages and weighting them to correspond with their respective drainage areas as follows:

Drainage area of main stem Youghiogheny sub-basin - 322 square miles
Average streamflow at Friendsville gage - 2.187 cubic feet per square mile
Drainage area of Casselman sub-basin - 97 square miles
Average streamflow at Grantsville gage - 1.872 cubic feet per square mile
Total area of Youghiogheny basin in Maryland - 418.9 square miles

$$\frac{(322 \times 2.187) + (97 \times 1.872)}{418.9} = 2.11 \text{ cubic feet per square mile}$$

An average annual streamflow of 2.11 cubic feet per square mile is equivalent to 28.5 inches of precipitation, or about 60% of the average annual total rainfall in the Youghiogheny basin.

Except for a small amount of recharge to ground water, the difference in total precipitation and streamflow (which includes both surface and sub-surface runoff) is returned to the atmosphere by evaporation from water, plant and land surfaces and transpiration, which is the loss of water exuded by plants. These processes combined, known as evapotranspiration,

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[1] that discharge averaged over a period of seven consecutive days which is exceeded by all such seven-day flows in nine out of every ten years (on the average)

[2] the lower five-percentile of the daily mean flows of record. This is the streamflow criterion used by the Maryland Department of Health as a basis for setting sewage treatment requirements.

These calculations were extracted from a report by Darling (1962) on discharge characteristics of Maryland streams.

Table 3. Average and Low Flows at Stream Gaging Stations - Youghiogheny River Drainage Basin in Maryland

Stream and Location of Gage	Period of Record	Drainage Area, Square Miles	STREAMFLOW							
					Low Flow					
			Average of Record		Minimum Daily of Record		Probable[1]			
							7-day, 10-year		Duration 95 per cent	
			cfs	cfsm	cfs	cfsm	cfs	cfsm	cfs	cfsm
Youghiogheny River near Oakland, Md.	1941-62	134	288	2.149	2.5	0.019	4.8	0.036	13.0	0.097
Youghiogheny River at Friendsville, Md.[2]	1898-1904 1940-62	295	645	2.187	10.0	0.034	52.0	0.176	97.0	0.329
Youghiogheny River at Youghiogheny River Dam, Pennsylvania[2]	1939-60	436[3]	848	1.945	0.0	0.0	--	--	--	--
Casselman River at Grantsville, Md.	1947-62	62.5	117	1.872	0.0	0.0	1.4	0.022	4.6	0.074
Big Piney River near Salisbury, Pa.	1932-62	24.5[4]	38.2	1.559	0.08	0.003	0.1	0.004	0.7	0.029

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[1] Source: Darling (1962); probable low flows were adjusted by Darling to reference period 1913-1957.

[2] adjusted for storage since 1940.

[3] 350.2 in Maryland.

[4] 23.6 in Maryland.

account for about 18.5 inches of precipitation (39% of the total precipitation) in the Youghiogheny basin.

The equation for the hydrologic budget (Precipitation = Streamflow + Evapotranspiration ± Change in Ground water level) is now completed except for the change in ground water level. Over a period of time, ground water recharge will equal runoff from underground aquifers; therefore, the change in ground water level should approximate zero. These data indicate a comparatively high rate of streamflow per square mile of drainage area, possibly exceeded in the State only by the North Branch Potomac sub-basin.

INVENTORY OF SURFACE AND GROUND WATER

The water resources of the Youghiogheny River basin are found in its surface streams, lakes and reservoirs, and in the water-bearing formations underlying the watershed.

Surface Waters

Appendix A includes a list of streams comprising the surface drainage system of the Youghiogheny River basin in Maryland. In addition to streams, Appendix A includes stream gaging stations, water intakes, waste outfalls, and other items of significance. A condensed list, including stream gaging stations, water intakes and waste-water outfalls, is presented in Appendix B. For a more detailed description of this material and the methodology employed, refer to the General Reference Section* - DESCRIPTION OF APPENDICES.

Reservoirs, Lakes and Ponds

Major impoundments, either totally or partially within the Maryland portion of the Youghiogheny basin include the Youghiogheny River Reservoir and Deep Creek Lake. Other impoundments in the basin, with the exception of those classified as "farm ponds" are listed with pertinent data in Appendix C. A recent survey by the Department of Game and Inland Fish (Barry, 1964) lists 163 farm ponds in the basin area. Results of this survey are discussed in the General Reference Section of the Summary Volume under the heading WATER RESOURCE REGULATION AND DISTRIBUTION.

Youghiogheny River Reservoir - The Youghiogheny River Reservoir is impounded by a 185 foot high, earth-fill dam located about a mile above the mouth of the Casselman River at Confluence, Pennsylvania (m.p. 74). The long, narrow reservoir crosses the State line at m.p. 87 and extends back to m.p. 92 near Friendsville, Maryland. The dam controls a drainage area of 434 square miles. The reservoir has a usable storage capacity of 248,800 acre-feet (approximately 81.1 billion gallons) and had a surface acreage of 3,566 acres.

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* In this report, reference is frequently made to a General Reference Section. This Section is included in the Summary Volume (Volume 6).

Storage in the reservoir is regulated to meet flood control and low flow augmentation for navigation and pollution abatement in the downstream (Pennsylvania) region. In addition to these uses, the reservoir is visited by over 600,000 recreationists annually (Corps of Engineers, 1965). Hydro-electric power generation was proposed but never included in the project; this subject is discussed in detail beginning on page 18. In operation since 1948, the reservoir and dam are operated and maintained by the Corps of Engineers as a unit in the coordinated reservoir system serving the Ohio River basin.

Deep Creek Lake - Deep Creek Lake is located two miles from the mouth of Deep Creek (m.p. 106 on the Youghiogheny) and about seven miles north of Oakland. Drainage area at the dam site is 64.7 square miles. The 3,900-acre lake has a usable storage capacity of 92,975 acre-feet (30.3 billion gallons). Owned by the Pennsylvania Electric Company, the lake is operated primarily for the generation of power transmitted outside of Maryland to a Pennsylvania service area. The lake is a major recreational area in Western Maryland, attracting an estimated 130,000 visitors annually (Corps of Engineers, 1965).

More detailed information on Deep Creek Lake is found under the following headings: Water Resource Regulation, Hydro-electric Power Sites, Instream Water Uses, and Water Quality.

Ground Water

Geologic formations and their water-bearing properties are described briefly in Table 4. The structural units (i.e. anticlines and synclines) referred to are shown on the map below. According to the most detailed report on ground water in Garrett County (Amsden, et al, 1954) the yields, specific capacities and depths of wells ending in the different water-bearing formations show no significant differences. One reason may be that many domestic wells are not tested at their maximum capacity. Conversely, where a large supply is needed and several wells are drilled into a particular formation and tested to their maximum capacity to obtain the required supply, the apparent average yield for wells tapping that formation may be above that for other formations tapped by only domestic wells. Despite the lack of detailed information, the yields, specific capacities and depths summarized in Table 4 do provide a guide to the water yielding potential of the formations.

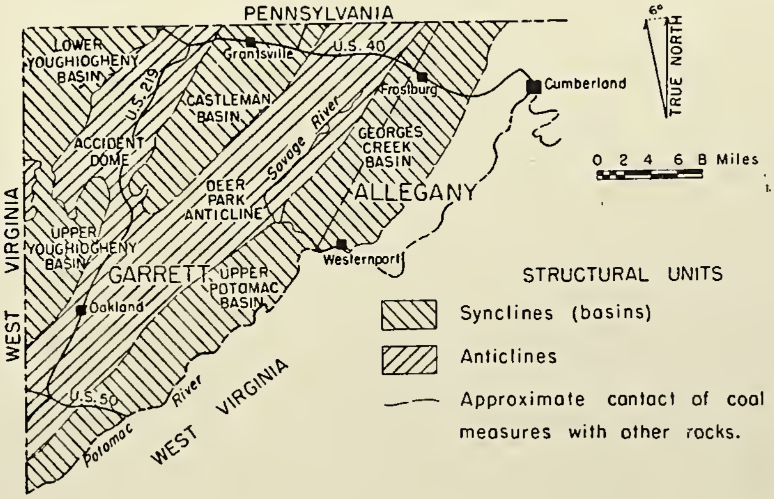

Table 4. Major Geologic Formations and Water-Bearing Properties

System & Formation	Average Depth of Wells (feet)	Average Yield of Wells (gals/min)	Specific Capacity (gals. a min. per foot of drawdown)	Water-Bearing Properties
Pennsylvanian				
Upper Conemaugh	66	8	--	Of minor importance as a water-bearing formation of limited extent in the Casselman basin. Adequate spring and well supplies obtained for domestic use. Average yield of wells about 8 gallons a minute.
Lower Conemaugh	83	15	1.5	Important water-bearing formation in the Casselman basin and in the Upper Potomac basin. Adequate well and spring supplies for commercial and domestic use. Yields as much as 75 gallons a minute to wells. Average yield 15 gallons a minute.
Allegheny)	77	26	0.9	Important water-bearing formation in the synclinal basins. Adequate well or spring supplies for small commercial and domestic use. Yields as much as 40 gallons a minute to wells; average yield 14 gallons a minute.
Pottsville)				Important water-bearing formation in synclinal basins and on their flanks. Only a few wells derive water from this formation; yields as much as 200 gallons a minute; average yield of five wells about 38 gallons a minute. Springs that issue from rocks of this formation are an important source of water; some discharge at a rate of 10 gallons or more a minute.
Mississippian Mauch Chunk	87	15	0.4	Of moderate importance as a water-bearing formation along the flanks of the Deer Park anticline and the edges of the Accident dome. Utilized as a source of water for domestic wells primarily in the vicinity of Deep Creek Lake. Yields as much as 24 gallons a minute to wells; average yield 15 gallons a minute. Several springs are used for water supplies.

Table 4. Major Geologic Formations and Water-Bearing Properties (Cont'd)

System & Formation	Average Depth of Wells (feet)	Average Yield of Wells (gals/min)	Specific Capacity (gals. a min. per foot of drawdown)	Water-Bearing Properties
Mississippian				
Greenbrier	91	14	0.9	Of moderate importance as a water-bearing formation along the edges of the major anticlinal structures. Yields as much as 20 gallons a minute to wells; average yield 14 gallons a minute. Several springs are used for water supplies.
Pocono	85	13	0.8	Important water-bearing formation in the areas of the Deer Park anticline and Accident dome. Many well and spring water supplies, including town of Oakland public supply, obtained from rocks of this formation. Yields as much as 130 gallons a minute to wells; average yield 13 gallons a minute. Many springs used for municipal and domestic water supplies, some discharging at a high rate.
Devonian				
Hampshire	94	14	0.7	Important water-bearing formation in the Deer Park anticline and Accident domes areas. Most existing wells are along Deep Creek Lake and in and near Accident. Yields as much as 57 gallons a minute to wells; average yield 14 gallons a minute. Springs adequate for domestic use issue from rocks of this formation.
Jennings	84	10	0.4	Important water-bearing formation in the area of the Deer Park anticline for domestic and farm water supplies. Yields as much as 40 gallons a minute to wells; average yield 10 gallons a minute. Springs for domestic water supplies used commonly; most numerous in the central part of the Deer Park anticline area.

Source: Amsden, et al, 1954

The most favorable places for the development of large ground-water supplies are in the synclinal coal basins where the Allegheny and Pottsville formations may be penetrated by drilling to moderate depths. The presence of coarse-grained, massive or fractured permeable sandstones within these formations probably explains the relatively high yields obtained from some wells ending in them. The yields of 18 wells in this area average more than 26 gallons a minute, and yields in excess of 200 gallons per minute have been reported from a few wells. However, where these strata lie at considerable depth the water may be of poor quality and unsuitable for use without dilution or treatment (Amsden, et al, 1954).

Springs are important sources of domestic and municipal ground-water supplies in Garrett County. The springs are mostly gravity springs which flow from the lower part of permeable strata where they are underlain by less permeable strata along the sides of valleys and draws. Although varying considerably, the flow from most of the springs was less than 10 gallons a minute at the time of measurement. Springs provide the public water supply for Grantsville, Friendsville, Mountain Lake Park, and Loch Lynn Heights.

WATER RESOURCES REGULATION AND DISTRIBUTION

Water requirements in the Maryland portion of the Youghiogheny basin are comparatively small and therefore development in the form of regulatory structures and distribution systems is minimal. The major developments in Maryland primarily serve the downstream Pennsylvania area - Deep Creek Lake for the generation of power sold in a Pennsylvania service region and the Youghiogheny River Reservoir for flood control and low flow augmentation downstream from the Maryland boundary.

Regulation by Reservoirs

The dam impounding the Youghiogheny River Reservoir at m.p. 74 is located about 13 miles below the Maryland-Pennsylvania line (m.p. 87) with the pool area extending back to the vicinity of Friendsville (m.p. 92). Except for creating the five mile pool area between Friendsville and the State line, the dam and reservoir have no other regulatory effect on streamflow in Maryland.

Deep Creek Lake controls a drainage area entirely in Maryland and is therefore the more important regulatory facility. Storage and releases of water at Deep Creek Lake (usable capacity of 92,975 acre-feet) have a moderating effect, particularly on low flows, of the main stem Youghiogheny below the mouth of Deep Creek (m.p. 106). The regulatory effect of storage and release operations at the Lake is indicated by comparing records of adjusted and unadjusted streamflow at the Friendsville gage, 13 miles downstream. Table 5 compares these data for the 1962 water year as an example of the regulatory effect.

Table 5. Regulatory Effect of Hydroelectric Operations at Deep Creek Lake on Streamflow at Gage "Youghiogheny River at Friendsville, Maryland" Water Year 1962

	Unadjusted mean monthly flow at gage cfs	Change in content of Lake at end of month		Adjusted mean monthly flow at gage cfs
		acre-feet	equivalent in cfs	
Oct. 1961	179	- 8,700	-142	37
Nov. 1961	304	- 6,000	-101	203
Dec. 1961	758	- 1,000	- 15.8	742
Jan. 1962	965	+ 7,700	+125	1,090
Feb. 1962	1,006	+10,500	+190	1,196
March 1962	1,451	+ 8,100	+131	1,582
April 1962	1,057	+ 2,300	+ 37.5	1,094
May 1962	365	- 1,200	- 18.1	347
June 1962	426	+ 800	+ 12.5	438
July 1962	223	- 4,100	- 66.4	157
Aug. 1962	124	- 6,600	-107	17
Sept. 1962	109	- 3,500	- 59.8	49.2

Source: Surface Water Records of Maryland & Delaware (Geological Survey, 1962)

Little Youghiogheny River - A small watershed project (P.L. 566) for the Little Youghiogheny watershed was authorized in 1957. The project includes a combination of land treatment, stream channel improvement and six structural measures to reduce flood damage in the Oakland area (Soil Conservation Service, 1956, 1963). These impoundments will have a total storage capacity of 3,225 acre-feet.* According to the latest

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* Location and other data on these impoundments is found in Appendix C.

Soil Conservation Service progress report, four impoundments have been constructed and a fifth is nearly completed. Although the structures are primarily flood control measures, the project sponsors (Commissioners of Garrett County, Garrett County Soil Conservation District, City of Oakland and the Wilson Run Public Watershed Association) have indicated their interest in adding recreational and perhaps municipal water features to one of the remaining sites.

Regulation by Diversion

Only one out-of-basin diversion is known to exist in the Maryland portion of the Youghiogheny basin. The City of Frostburg, Maryland, located in the Potomac Basin (Allegany County) uses Big Piney Creek, a tributary of the Casselman River, as a source of water supply. The City has constructed a reservoir with a capacity of 150 acre-feet on m.p. 7.6 of Big Piney Creek. Although Frostburg has other sources of supply from wells, springs and the Savage River in the Potomac basin, it is believed that the greater portion of the 450,000 gallons per day used by the City comes from the Big Piney Creek source. Waste discharges from Frostburg are transported via interceptor to the Cumberland sewage treatment plant which is in the North Branch Potomac sub-basin.

The City of Oakland withdraws water for municipal supply from the main stem Youghiogheny and discharges its waste water from several sources within 1.5 miles of the mouth of the Little Youghiogheny River. From the viewpoint of streamflow regulation, this diversion of 250,000 gallons per day is of little significance since the point of diversion and the mouth of the Little Youghiogheny River are within one-tenth of a mile.

UNDEVELOPED RESERVOIR SITES

Existing reservoirs and impoundments are discussed in the preceding section on water regulation and under Inventory of Surface Water. Other reservoirs and impoundments have been proposed for purposes of flood control and/or hydro-electric power generation, but no further development has occurred.

Reports of the Corps of Engineers (1944, 1949) indicated that flood damage on the main stem Youghiogheny, a problem of major significance only in the downstream Pennsylvania stretch of the river, would be reduced considerably by the Youghiogheny River Reservoir. (The reservoir was completed in 1948). Local flood problems in Maryland were recognized, however, and two sites were investigated for possible location of flood control measures. Site data and the flood control projects considered were as follows:

Location					
River	Mile Point	Name	Drainage Area sq. miles	Capacity acre-feet	Type
Youghiogheny	119	Crellin	56	96,000	Concrete
Casselman	73-47	Grantsville	57	102,000	Earth-fill

The Grantsville project was not recommended for construction because of the lack of economic justification. The Crellin site was given further consideration as a component of a basin-wide hydro-electric system which is discussed in more detail in the following section.

Sites Investigated for Hydro-electric Power Development

The 1944 and 1949 reports of the Corps of Engineers discussed at great length the possibility of developing a hydro-electric power system in the Youghiogheny basin. Recognizing that power requirements in the

Johnstown, Pennsylvania - Wheeling, West Virginia area had increased significantly during World War II, the report projected a continuing growth in power demand even after the war. The Corps estimated that the service area of the Youghiogheny - Monongahela basins would have an increased need for 5.9 million kilowatts of power capacity by the year 1970 and on this basis, considered the possibility of producing some portion of this demand from hydro-electric developments in the Youghiogheny. In addition to the existing power development at Deep Creek Lake, sites investigated for power-generating facilities and/or water regulating measures required for a power system included the Youghiogheny River Reservoir (then under construction but containing no power facilities), the previously mentioned Crellin site, Sang Run, Swallow Falls and two locations near Victoria, Pennsylvania. It is of interest to note that the Youghiogheny Hydro-electric Corporation had previously surveyed several of these same sites with the intention of extending its power operations in the basin.

Site locations and other details on the power network considered for the Youghiogheny basin are given in Table 6.

The Corps' report of 1944 discussed the merits of a system of reservoirs in the Youghiogheny basin which would be operated primarily for flood control and power generation and only incidentally for navigation and pollution abatement. As one of the projects in the system, the then unfinished Youghiogheny River Reservoir would be equipped with power generating facilities. The economics of the proposed system were compared against the operation of the single Youghiogheny River Reservoir for its originally intended purposes - flood control, navigation and pollution abatement. Although the proposed reservoir system was designed to provide the same

Table 6. Sites in Proposed Hydro-electric Power System

Location			Drainage Area	Capacity	Surface Area	Power Production	
Stream	Milepoint	Site Name	sq. miles	A/F	Acres	Install-ation kilowatts	Average Annual Output kw hrs (000)
Youghiogheny River (Md.)	119.2	Crellin	56	95,000	3,650	0[1]	0[1]
Youghiogheny River (Md.)	107.5	Swallow Falls	162	7,500	625	24,000	57,400
Deep Creek (Md.)	106.0/2.0	Deep Creek (existing)	65	106,000	3,900	19,200	25,400
Youghiogheny River (Md.)	98.5	Sang Run	274	17,800	512	69,000	162,000
Youghiogheny River (Md.-Pa.)	74.2	Youghiogheny River Reservoir (under construction at time)	435	154,000	3,566	24,000	54,000
Youghiogheny River (Pa.)	66.5	Victoria (power)	1,053	2,100	185	45,000	189,000
Youghiogheny River (Pa.)	52.6	Victoria (re-regulation)	1,143	1,600	87	0[2]	0[2]

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[1] Crellin project to provide flow regulation for downstream power developments

[2] Re-regulation at Victoria for downstream navigation and pollution abatement needs

downstream, low-flow augmentation benefits, it was found to be a less feasible operation than the single project plan, largely because of the high cost, power-generation features. The 1949 report of the Corps further substantiated this conclusion by not recommending the construction of the power facilities studied previously.

The significance of these studies for present consideration is in the identification of potential reservoir sites. Although probably never to be justified for the purposes originally considered, their development may become feasible for other uses such as water supply or recreation.

INVENTORY OF SURFACE-WATER USES

Surface-water uses can be classified as withdrawal of instream uses; the latter classification can be further divided into flow and on-site uses. These terms and others are described in the General Reference Section --INVENTORY OF SURFACE WATER USES. Tabular material concerning water use appears in Appendix B (intakes, outfalls, gaging station records) and Appendix F (ground-water permits). No permits for surface water withdrawals from the waters of the Youghiogheny basin have been issued.

Withdrawal Uses

The withdrawal uses of surface waters can be classified as municipal, institutional, industrial or agricultural uses. A fifth category sometimes employed is rural-domestic use, but this seldom involves surface water. Only the four classifications need be discussed for the Youghiogheny basin.

Municipal and Institutional Surface Supplies - There are two municipal and no institutional systems supplied with surface water from the Youghiogheny River and its tributaries. One of the municipal systems, Frostburg, lies outside the basin but diverts water from Big Piney Creek, a tributary of the Casselman River. This withdrawal was described previously under Interbasin Diversions.

Until recently, the City of Oakland, located at the mouth of the Little Youghiogheny River, obtained its water from a spring and five wells. The combined yield of these sources normally was about .576 mgd; this dropped in the summer months to .288 mgd. In 1962, Oakland completed construction of a pumping station and filtration plant and began withdrawing water from the Youghiogheny River just above the mouth of the Little

Youghiogheny. The new facilities have a capacity of .500 mgd which can be expanded to a million gallons per day.

As of 1960, Oakland serviced 2,100 residents (85,000 gpd), commercial interests to the extent of 25,000 gpd and a poultry processing plant in the amount of 125,000 gpd. (Today, the processing plant uses ground water from wells on its property and those previously used by the City.) The extension of the Oakland system to include two upstream communities, Mountain Lake Park and Loch Lynn Heights, was recommended in a 1960 consultant report (Whitman, Requardt and Associates, 1960). The consultants predicted that the present supply for the 1,400 residents obtained from springs, artesian wells and pumped wells would be inadequate by 1970.

In order to service these upstream communities, Oakland would have either to modify its existing agreement with the Pennsylvania Electric Company concerning withdrawals from the Youghiogheny or augment its supply from other sources. The agreement with the Company which holds riparian rights to the River in the vicinity of the mouth of the Little Youghiogheny prohibits Oakland from reselling water to other municipalities or water distributing agencies. Oakland could utilize water stored in one of the small watershed projects now under construction (as discussed on pages 16 - 17) or pump from its previously used wells.

A surface water supply for Grantsville in the Casselman subbasin was recently considered by the Soil Conservation Service in a preliminary watershed study (Soil Conservation Service, 1964). Although primarily concerned with flood control and land management, the study indicated that multiple-purpose structures including water supply may be feasible. The present municipal system services 500 residents with an average of 50,000 gallons per day from wells and springs.

Industrial Surface Water Supplies - There are no known industrial users of surface water in the Maryland portion of the Youghiogheny basin.

Agricultural Use of Surface Water - Agricultural uses of water in the Youghiogheny basin have not been of major significance in the past. A 1959 irrigation survey (Galbreath, 1960) indicated only 236 acres in all of Garrett County were irrigated. Because of normally abundant rainfall, soils with large moisture-holding capacity, a topography not suited to water distribution and an agricultural economy oriented largely to livestock and livestock products, there is little reason to expect any sizeable increase in irrigation. Even orchard spraying does not appear to be an extensive water use - there are only about 100 acres of orchard in the entire county.

The Maryland Department of Game and Inland Fish lists 163 "farm ponds" in the Youghiogheny basin. These normally average less than 0.5 acres in size and 1.8 acre-feet in capacity (Barry, 1964).

Instream Water Uses

Water uses which do not require removal of water from its natural surface waterway are frequently termed non-withdrawal or instream uses. These uses include hydro-electric power generation, navigation, fishing, recreation, and waste disposal. Although these instream functions are non-consumptive, the use of water for any one of them may - and frequently does - conflict with uses for other non-withdrawal purposes, as well as with the various withdrawal uses. On the other hand, provision of water in a stream for one purpose may automatically provide more water for other purposes. For these reasons, instream water uses must be considered in any evaluation of water supply and demand.

Hydro-electric Power Generation - Both private interests and Federal agencies have considered the generation of additional hydro-electric power on the Youghiogheny. The power development scheme prepared by the Corps of Engineers (discussed under Undeveloped Reservoir Sites) was based largely on data in a previously prepared plan of the Youghiogheny Hydroelectric Company (a subsidiary of the Pennsylvania Electric Company) for expansion of its existing facilities. These plans never materialized and the Deep Creek facility is still the only power generating unit in the Maryland sector of the Youghiogheny basin. The Company still owns about 1,500 acres of land along the Youghiogheny River between Oakland and Friendsville, an area which includes two of the previously studied sites, Swallow Falls and Sang Run.

Navigation - The Youghiogheny River is not used for navigation in Maryland, but is navigable in the McKeesport (Pennsylvania) area. A dredged channel is maintained from the mouth of the Youghiogheny up to 15th Street in McKeesport, a distance of 1.3 miles. The channel permits movement of vessels with a nine-foot draft at low water stage. Augmented streamflow for navigation is provided by a portion of the storage in the Youghiogheny River Reservoir.

Recreation - Over 29,000 acres of State-managed land in the Maryland portion of the Youghiogheny basin are available for various forms of recreation. This total includes acreage in State forests (used primarily for fishing, hunting and primitive camping) and parks, recreation and wildlife management areas as follows:

State forests	23,483 acres
State parks	1,831
recreation areas	2,179
wildlife management areas	1,800
	29,293 acres

In addition to these State-owned areas, Deep Creek Lake and portions of its peripheral shoreline are also available for recreation. Since 1927, the Youghiogheny Hydro-electric (now Pennsylvania Electric Company) Company has leased the lake to the State of Maryland for one dollar a year. Under terms of the lease, the Department of Game and Inland Fish has complete control of the waters of Deep Creek Lake for fishing, boating and other water-based recreation. The Department does not control the water level nor the land around the lake known as the safety strip. Under a separate lease, the Department controls the land around the McHenry fish propogation area and two stretches of lake shore used for public fishing.

In the late 1920's, the power company instituted a Privilege Permit System under which adjoining land owners could have the exclusive use of a part of the safety strip for a nominal annual fee. At present, there are some 1,300 permit holders around the lake, each of whom pays an annual fee of $5.00. Since 1957, the Pennsylvania Electric Company has also leased two miles of lake shore adjacent to Deep Creek Lake State Park to the Maryland Department of Forests and Parks.

Although the greater portion of the Youghiogheny Reservoir and all of the surrounding area containing recreational facilities are in Pennsylvania, these are accessible to Marylanders via U. S. Route 40. Other water-oriented recreation, fishing in particular, is provided by the 480 miles of running water within the Maryland portion of the basin. The Maryland Department of Game and Inland Fish has stocked 86 acres of Youghiogheny waterways with trout; the remaining areas are managed for warm water species.

The stretch of Youghiogheny River extending from Oakland to the Youghiogheny Reservoir is being considered for inclusion in the

"Wild River" program of the Federal Government. As defined in the enabling legislation, a wild river area is one in which the water and related adjacent land area should be left in its free-flowing condition, or that should be restored to such condition, in order to promote sound water conservation, and promote the public use and enjoyment of the scenic, fish, wildlife, and outdoor recreation values. The effect "wild river" status would have on existing development in the basin is unknown at this time, but it would probably limit any future activity that might impair the free-flowing stream.

Waste Disposal - A general discussion on this subject is found in the General Reference Section - INVENTORY OF SURFACE WATER USE. Appendix B of this report indicates the location of municipal and industrial outfalls and quantities discharged. The effect of these discharges on quality of the receiving streams is discussed under Water Quality.

Appendix F lists water users holding permits from the State to take and use ground water. The law requiring permits exempts domestic, agricultural and approved municipal users; therefore the listing is comprised primarily of industrial and commercial appropriations.

Approximately 9,300 residents of the basin depend upon individual wells; the remaining population living outside the Oakland area (about 3,500) are served by five municipal systems using ground water. Table 7 lists pertinent data on the five municipal systems.

Table 7. Municipal Systems Using Ground Water in the Youghiogheny Basin

Community or Facility	Population Served		Estimated Average Output MGD
Crellin	800		0.060*
Friendsville	600		0.050
Grantsville	500		0.038*
Mt. Lake Park and Loch Lynn Heights	1,450		0.084
Pleasant Valley	170		0.010
		TOTAL	0.242

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* Estimated on basis of per capita consumption of 75 gpd

Mentioned previously was the possibility of the Mountain Lake Park - Loch Lynn Heights area being serviced by Oakland. As projected by a consultant report (Whitman Requardt and Associates, 1960) ground water sources presently being used by the two communities are not expected to be adequate after 1970. The discussion on page 23 indicates the possible limitation on the extension of Oakland's present system and other possible sources of water for these communities in the Little Youghiogheny Watershed.

Industrial

As indicated in Appendix F, there are five industrial users of ground water in the basin using 10,000 gallons per day or more. The firms and appropriations permitted are as follows:

Firm	City	Withdrawal (gpd) Average	Withdrawal (gpd) Maximum
Garrett County Coop. Inc.	Grantsville	15,000	75,000
Grantsville Dairy, Inc.	Grantsville	13,500	13,500
Sterling Processing Corp.	Oakland	300,000	400,000
Union Fire Brick Co.	Grantsville	12,000	20,000
Yoder, Eli	Grantsville	33,000	100,800
		373,500	609,300

Appropriations of smaller users total less than 100,000 gallons per day.

To summarize, ground water is the major source of supply for both domestic and industrial use in the Youghiogheny basin. The single exception is the Oakland system which utilizes water from the Youghiogheny River. Although there may be some extension of the Oakland system and possibly several of the towns developing surface supplies, ground water sources probably will continue to provide most of the basin requirements in the future. If this is true, the surface waters of the basin can be allocated to other beneficial purposes, most important of which seems to be recreation.

WATER QUALITY

Although the Youghiogheny basin in Maryland is relatively undeveloped and still largely rural oriented, water quality conditions have been given considerable attention. One reason for this emphasis is due to the interstate aspects of the major mine drainage problem in the basin. A second reason is the relationship of quality conditions on the substantial area of the watershed devoted to recreation.

Water quality in the basin is discussed under sub-sections delineating stretches of the main stem Youghiogheny and in some instances, tributary streams.

Head of Youghiogheny River to Mouth of Little Youghiogheny River (m.p. 134.2 - 114.3)

Above Crellin, Maryland (m.p. 118.7), the headwaters of the Youghiogheny are occasionally troubled by rock quarry operations causing high turbidities. Except for turbidity, water quality is good as indicated by the management of this stretch for trout which have a low tolerance to most pollutants.

The reach of the Youghiogheny River extending from the mouth of Snowy Creek at Crellin to the confluence of the Little Youghiogheny River is the zone of maximum contamination with acid mine wastes. The mine wastes entering the Youghiogheny are carried by Snowy Creek and a tributary, Laurel Run. The wastes are a result of mining operations in West Virginia. During a two-year period of sampling by the Maryland

Water Pollution Control Commission, pH readings ranged from 3.1 to 5.5* (Hopkins, 1963). In addition to the high acidity, the river is characterized by a yellow precipitate ("yellow boy") and an even present milky floc of ferrous hydroxide, by-products of the mine effluent. Water quality in this zone remains continuously degraded to a point which precludes the existence of even the most tolerant species of fish.

Little Youghiogheny River (m.p. 114.3)

The Little Youghiogheny River receives .297 mgd of untreated domestic sewage from the sewered communities of Oakland, Mt. Lake Park and Loch Lynn Heights. Locations of the outfalls are listed in Appendix B; all are within six miles of the mouth of the Little Youghiogheny. In addition to domestic sewage, a poultry processing plant in Oakland discharges another .236 mgd of treated waste water in the Little Youghiogheny within a mile of the mouth (Chester Engineers, 1964). Summary data on the Little Youghiogheny and the main stem Youghiogheny above and below the mouth of the Little Youghiogheny are listed in Table 8.

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* pH readings of 5.0 or less are considered "acidic" and in areas of mining operation, may be indicative of a stream receiving acid mine drainage. In Western Maryland, however, there are many swamps and glades whose naturally acid waters frequently approach pH values in the vicinity of 5.0. Similarly, the area contains some mine effluents with pH values greater than 5.0. The Water Pollution Control Commission adopted a criterion of 5.8 as that value below which a stream would receive further investigation (Rubelman, 1963).

Table 8. Water-Quality Data, Youghiogheny and Little Youghiogheny Rivers, 1966

Station	Dissolved Oxygen ppm[1]	Coliform Organisms MPN/100ml[2]	E. Coliform Organisms MPN/100ml
Youghiogheny at Crellin (m.p. 118.1)	8.2	230	< 3
Little Youghiogheny upstream of Sterling Process (m.p. 114.3-0.86)	2.2	9,300,000	9,300,000
Little Youghiogheny near mouth (m.p. 114.3-0.43)	1.6	2,300,000	2,300,000
Youghiogheny downstream of Little Youghiogheny (m.p. 114.0)	8.0	230,000	< 3
Youghiogheny at Swallow Falls (m.p. 108)	8.8	640	93

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1 parts per million

2 most probable number per 100 ml of water

All data are median of 12 months of record

Source: Unpublished data in files of Department of Water Resources

Not indicated by these data is the fact that dissolved oxygen in this stretch of the Little Youghiogheny drops to 0 on many occasions because of the high BOD (biochemical oxygen demand) caused by the inflow of domestic and industrial wastes. A second point of note is the relationship of the number of E. coli organisms to coliform organisms in the Youghiogheny as compared to the Little Youghiogheny - in many instances, the two counts were the same in the Little Youghiogheny. Since E. coli are from warm-blooded animal wastes, these data indicate a definite public health hazard (Hopkins, 1963).

These data do not reflect the improved conditions expected to result from the recently completed treatment system installed by the processing company. No survey has been taken since its installation in September 1966. Still under consideration is a sewage treatment facility planned to serve Oakland, Mountain Lake Park and Loch Lynn Heights. The eventual operation of such a facility should result in the Little Youghiogheny no longer being considered a water quality problem area.

Youghiogheny River from Mouth of Little Youghiogheny to Swallow Falls (114.3-106.8)

The confluence of the Little Youghiogheny River marks the end of the zone of maximum mine waste contamination. The reduction in acidity is attributed in part to the neutralizing effect of the highly alkaline waters of the Little Youghiogheny carrying waste discharges from the various municipal and industrial sources. Although coliform counts are relatively high in this stretch of the mainstream, stream biota undergo progressive improvement and the stream begins taking on some of its former productivity. Periods of critical water quality, however, still limit the development of fish. Populations are sparse and the fish, mostly suckers and pond-fish species, are slow growing and stunted. Iron floc and yellow boy are prominent in the upper half of the recovery zone but in this sluggish section of river, most of it settles out before reaching Swallow Falls.

Youghiogheny River - Deep Creek (m.p. 106)

The 3,900 acre Deep Creek Lake, owned and operated by the Pennsylvania Electric Company, is the dominant feature of the Deep Creek watershed. Recreational use of the lake and leases of peripheral land by the Company have resulted in extensive development of the lakeshore area with summer cottages, motels and restaurants; in total, there are about

2,000 privately owned properties on and adjacent to the lake. As discussed previously, portions of the lakeshore area also are leased to the Maryland Departments of Game and Inland Fish and Forests and Parks.

A sampling program conducted by the Departments of Health and Water Resources during the summer and fall of 1965 indicated good water quality in the lake, at least with respect to coliform-organism counts. Of 131 samples taken from 21 locations on seven different occasions during the May-October period, 92 samples had coliform counts (most probable number) of less than 100, 129 samples had less than 1,000 and only two of more than 1,000.

A tributary entering the lake, Cherry Creek, suffers from acid conditions along its entire length. The pH at 4 stations on Cherry Creek ranged from 4.7 near the mouth to 4.0 near its source (Rubelman, 1963). Acidity does not appear to be a serious problem in either the lake or in Deep Creek.

Youghiogheny River - Deep Creek to Friendsville (m.p. 106-91.8)

Three tributaries entering the Youghiogheny in this stretch, White Rock Run (m.p. 98), Trap Run (m.p. 97.4) and Laurel Run (m.p. 95.5), are polluted with mine wastes. pH readings in 1962 (Hopkins, 1963) indicated pH conditions as follows:

Tributary	Low	Median	High
White Rock Run	3.3	4.1	4.9
Trap Run	2.9	4.5	5.3
Laurel Run	4.8	5.9	8.5

While these pH readings are as low as any in the entire basin, the mine wastes in these small tributaries are not of sufficient volume to be noticed in the main stem Youghiogheny.

Youghiogheny River - Friendsville to Maryland-Pennsylvania Boundary (m.p. 91.8-86.3)

Between Friendsville and the State line, the river is within the pool area of the Youghiogheny Reservoir. Bear Creek with a drainage area of 50 square miles is the major tributary entering the Youghiogheny in this reach.

Friendsville (1960 population of 580) discharges untreated sewage to both the Youghiogheny River and Bear Creek. The Town of Accident (1960 population of 237) in the Bear Creek watershed discharges a sewage effluent to Bear Creek after treatment in either septic tanks and leaching fields or in seepage pits. Inadequate septic tank maintenance and reduced porosity of soils in the leaching areas has created a sanitary problem. Maryland health authorities state that they have received numerous complaints concerning sewage flow in open ditches and resultant odor problems (Neiland Engineers, 1960).

A survey conducted by the Water Pollution Control Commission during the period 1960-1963 indicated high bacterial coliform densities in both Bear Creek and the mainstem Youghiogheny. During the summer months (when recreational use of the reservoir is at its peak) of 1961 and 1962, and again in September, 1966, bacterial counts in the area were as follows:

Coliform MPN/100 ml.

Date	Yough. R., North of Friendsville Island		Bear Creek at Friendsville		Yough. R. at Friendsville Bridge	
	Coli	E. Coli	Coli	E. Coli	Coli	E. Coli
5/16/61	9,300	2,300	43,000	3,900	2,300	230
6/27/61	9,300	1,500	930	240	930	230
7/25/61	2,300	2,300	2,300	2,300	9,300	9,300
8/23/61	4,300	930	3,900	2,300	750	93
9/25/61	23,000	1,500	75,000	23,000	75,000	7,500
5/14/62	2,100	430	750	230	2,300	930
6/18/62	2,300	230	2,300	230	2,300	430
7/16/62	23,000	930	23,000	2,300	4,300	2,300
8/13/62	23,000	2,300	43,000	2,100	2,300	230
9/19/62	2,300	930	9,300	4,300	1,500	230
9/7/66	4,300	930	15,000	230	23,000	2,100

In its report, the Public Health Service (Sidio and Mackenthun, 1963) stated that coliform densities of over 4,000 per 100 ml. were present just below the State line. Also that these values are in excess of the recommended limit for water contact sports (1,000 coliforms per 100 ml.).

Neither community has initiated construction of treatment facilities. Chester Engineers (May 24, 1965) has prepared a feasibility report covering sewage collection and treatment for the Town of Accident. The consultants recommended the installation of sewers and a sewage treatment plant utilizing the activated sludge process. The total project cost was estimated to range between $138,000 and $172,000, depending upon the number of residences to be connected.

Casselman River (m.p. 7.31-53.5 - 73.1-45.9)

The Casselman River, largest Maryland tributary of the Youghiogheny, drains an area of 97 square miles in Maryland and 479 square miles in Pennsylvania before entering the Youghiogheny at Confluence.

Pennsylvania (m.p. 73). Both domestic and acid-mine wastes create problems in the Maryland portion of the sub-basin.

Of the 50 stations sampled for mine drainage in the sub-basin during the period 1960-1963, 17 had pH values of 5.8 or less and of these readings, 10 were 4.5 or less. Areas of major acid-mine contamination were the eastern slope of Negro Mountain (North Branch Casselman) and the South Branch Casselman below Browning Bear Hill (Hopkins, 1966). Most of the streams receiving acid-mine drainage are small and unnamed. A more detailed discussion of mine drainage in the Youghiogheny basin is found on page 40.

Domestic wastes originate from the sewered community of Grantsville (1960 population of 446). Sewage in the amount of 20,000 gallons a day is partially treated in two septic tanks located near the old U. S. 40 and then discharged to the Casselman River. Sampling by the Public Health Service in 1963 (Sidio and Mackenthun, 1963) indicated an average coliform count of 88,000 (mpn/100 ml.) and a maximum of 190,000. Average and maximum fecal streptococci counts of 71,030 and 300,000 were also recorded.

A report prepared for Grantsville by Neilan Engineers (May, 1963 revised April, 1964) recommended the construction of a sewage treatment plant with a design flow of 41,900 gpd. Maximum activated solid or extended aeration treatment was recommended. According to the report, the plant would reduce the Biochemical Oxygen Demand in the effluent by 85%.

Interstate Aspects

The Youghiogheny River is of interstate concern as it flows from West Virginia into Maryland and again as it crosses from Maryland into Pennsylvania. The Casselman River, tributary to the Youghiogheny, is interstate between Maryland and Pennsylvania. Laurel Run and Snowy Creek, tributaries to the Youghiogheny headwaters, are also interstate between West Virginia and Maryland.

The major interstate problem in the upstream area is the acid-mine drainage originating in West Virginia and entering Maryland via Snowy Creek and Laurel Run as discussed previously. Maryland has requested the aid of West Virginia in cleaning up this section of the Youghiogheny. A proposal was made to the West Virginia Water Resources Commission to use the Snowy Creek-Laurel Run watershed as a pilot pollution control watershed program. The 1963 session of the West Virginia legislature appropriated $20,000 for additional studies of the polluted area.

Snowy Creek is also an interstate carrier of bacteriological pollutants contained in the sewage effluent of a state hospital located near Corinth, West Virginia. Although coliform counts have been recorded as high as 43,000 (MPN/100 ml.) above the mouth of Laurel Run, the median count was 430 for the sampling period (Hopkins, 1963). Coliform counts were lower below the mouth of Laurel Run and even further reduced at Crellin where Snowy Creek enters the Youghiogheny. Aside from natural die-off, the reduction in coliform count is probably influenced by the high acidity of the waters in this region.

Domestic waste effluent from Grantsville is primarily a local situation in the Casselman sub-basin and is not considered an interstate problem, according to a report of the Public Health Service (Sidio and Mackenthun, 1963). The same report does indicate, however, that the untreated sewage from Friendsville creates an interstate problem in the Youghiogheny reservoir area. To date, no corrective action has been initiated by Friendsville for reducing the pollution problem.

Intrastate Problems

Except for the acid-mine drainage in the headwater region and the degradation of water quality below Friendsville, water-quality problems in the Youghiogheny Basin are of an intrastate nature. These intrastate problems have been discussed elsewhere in this report.

Water-Quality Control

The control of water quality in the Maryland sector of the Youghiogheny River basin is vested in various State, Federal, local and county agencies. These are discussed in the General Reference Section. Although the Ohio River Valley Water Sanitation Commission includes jurisdiction over the Youghiogheny, Maryland is not a party to the interstate compact.

Special Water-Quality Surveys

The most extensive survey of the Youghiogheny basin has been conducted by the Maryland Department of Water Resources (formerly the Water Pollution Control Commission). A report (Hopkins, 1963) based largely on monthly sampling data during the period November, 1960 - January, 1963, was prepared by the Department. Data from the 1966 Survey has not been published, but selected information is included in the supplement to this report. The Department has also conducted an extensive mine drainage survey of the Youghiogheny basin. A report of the survey findings was released in 1966 (Hopkins, 1966).

The Natural Resources Institute of the University of Maryland has been engaged in a program of research into the biology of streams polluted with acid-mine drainage. A progress report (Reppert, 1964) has been prepared.

The concern of the Public Health Service has been mostly with the interstate aspects. A report on its findings was released in 1963 (Sidio and Mackenthun, 1963).

Summary on Water Quality

Except where septic systems are used, none of the domestic and municipal waste in the Youghiogheny basin is treated. Water quality is adversely affected by untreated or partially treated discharges in the Little Youghiogheny River (Oakland, Mountain Lake Park and Loch Lynn Heights), in Bear Creek and the mainstem Youghiogheny near Friendsville (Accident and Friendsville), and in the Casselman River near Grantsville. In spite of the efforts of the State Health Department, no corrective action has been initiated in any of these areas. A treatment system has been installed by the poultry processing plant located at the mouth of the Little Youghiogheny River; in the past, this has been the major source of industrial pollution in the basin.

With respect to mine drainage, a recently published report of the Maryland Department of Water Resources (Hopkins, 1966) indicates the magnitude of the problem in the Youghiogheny basin. The following tables summarize the report data.

Key to Table Headings

pH - Index, in descending scale, measuring acidity of water from mine effluents. Index numbers of 5.8 and below indicate water of high acidity.

A - Active

I - Inactive

IB - Inactive, Backfilled

INB - Inactive, Not Backfilled

	Deep		Strip			Combination			
pH	A	I	A	IB	INB	A	IB	INB	Totals
Youghiogheny Watershed									
Dry	1	8	1		2			1	13
6.8 - 8.5		1							1
5.9 - 6.7				1	1				2
4.6 - 5.8				1	1				2
4.6 or less	4	4		4	4		1	3	20
Totals	5	13	1	6	8		1	4	38

	Deep		Strip			Combination			
pH	A	I	A	IB	INB	A	IB	INB	Totals
Casselman Watershed									
Dry		11	1	9	4	2			27
6.8 - 8.5			1						1
5.9 - 6.7		1	1		2		1		5
4.6 - 5.8		1		5		1			7
4.6 or less			2	3	4			1	10
Totals		13	5	17	10	3	1	1	50
Deep Creek Lake									
Dry		1	1						2
6.8 - 8.5									
5.9 - 6.7									
4.6 - 5.8									
4.6 or less		2	2	4					8
Totals		3	3	4					10

At present the major water use limited by water quality in the basin is recreation, particularly in the efforts of the State to extend its sport fishery. Further recreation development can be expected in the Deep Creek area and possibly along the main stem if the Youghiogheny should be included in the national "wild-river" program. Recreational uses of water require good quality with quality standards approximating those for water supply if water contact activities are involved. It may well be that pressures for water-oriented recreation facilities will stimulate corrective action in those areas having quality problems.

SUMMARY

I. General Description

1. The only major Maryland river flowing north and into another state, the Youghiogheny is a tributary to the Monongahela River. The Monongahela, in turn, joins with the Allegheny River near Pittsburgh, Pennsylvania to form the Ohio River.

2. The Youghiogheny River has a drainage area of 419 square miles in Maryland, all within Garrett County. This area includes 63% of Garrett County and 3.5% of the State of Maryland. From an interstate viewpoint, the Youghiogheny watershed in Maryland comprises 5.5% of the Monongahela drainage area and less than 0.5% of the Ohio drainage basin.

3. The Youghiogheny basin in Maryland is predominately rural with more than half of the area in some form of forest land. A large portion of the basin area is state-owned and administered as parks, forests or wildlife refuges.

4. Approximately a third of the 15,000 basin residents live in incorporated areas. Except for Oakland, which has a population of 2,000, no community has a population exceeding a thousand and most are under 500.

5. Although land uses are oriented largely to agriculture, forestry and recreation, less than a third of the working population is employed in these activities. The largest source of employment is provided by the manufacturing industries and wholesale and retail trade in the small towns. Manufacturing is limited largely to apparel and woodworking plants and food processing with a scattering of small plants in other industries.

II. Hydrology and Water Resources

1. In comparison with other drainage basins in the State, the Youghiogheny has the greatest mean annual precipitation (48 inches) and the lowest mean annual temperature (48°F). Climatic conditions and topography account for a comparatively high rate of runoff, about 2.11 cubic feet per second per square mile. This is a higher average rate of runoff than that recorded at any other location in the State.
2. The Maryland portion of the Youghiogheny basin contains approximately 480 miles of surface streams. Characteristic of an area of rugged terrain, shallow soil and high runoff, most watercourses in the basin are of short length. The main stem Youghiogheny extends some 86 miles from its head to the Maryland-Pennsylvania state line. Four second-magnitude streams are between 11 - 18 miles in length and one third-magnitude tributary is 10 miles long. All of the numerous remaining tributaries are of shorter length, less than ten miles.
3. Deep Creek Lake, with an area of 3,900 acres and a capacity of 30 billion gallons at full reservoir stage, is the largest reservoir entirely within the Maryland portion of the Youghiogheny basin. It is also the largest reservoir in the State. About a third of the Youghiogheny River Reservoir (total area of 3,566 acres) is in Maryland; the remainder is across the Mason-Dixon Line in Pennsylvania. A small watershed program for the Little Youghiogheny subbasin will eventually include six impoundments with a total storage of 3,200 acre-feet.
4. Ground water and springs are used extensively in the basin as sources of water supply. Yields reported from different water-

bearing formations show no significant differences primarily because most domestic wells are not tested at their maximum capacity. Conversely, where a large supply is needed and several wells are drilled into a particular formation and tested to their maximum capacity to obtain the required supply, the apparent average yield for wells tapping that formation may be above that for other formations tapped by only domestic wells.

III. Water Use

A. Surface Water

1. Only two municipalities, Oakland and Frostburg, (the latter in the Potomac basin) use water from the Youghiogheny River or its tributaries in Maryland. A recent consultant report recommended that the service area of Oakland be extended to two other communities in the Little Youghiogheny basin, Mountain Lake Park and Loch Lynn Heights.

2. There are no known industrial intakes from surface waters in the Maryland portion of the Youghiogheny basin.

3. Agricultural water use is negligible in the basin. Less than 300 acres are under irrigation. An estimated 163 farm ponds are in the drainage area. These average less than one-half acre in size and 1.8 acre-feet in capacity.

4. The hydroelectric plant at Deep Creek Lake owned by the Pennsylvania Electric Company is the only such facility operating in the basin at this time. The addition of new facilities was considered first by the Pennsylvania Electric Company and later, during World War II, by the Corps of Engineers; however, there has been no further development.

5. Recreation is a major use of the water and land resources of the Youghiogheny basin. The 4,700 acres of reservoir surface area plus an additional 30,000 acres of state park and forest land provide recreation for thousands of people annually. A potential development is the inclusion of the Youghiogheny River in the national "wild river" system. At present, a very large portion of recreationists using the Garrett County facilities are from out of state. Proposed road construction under the Appalachia program will significantly reduce travel time to these recreation areas from large centers of population in Maryland.

6. The Youghiogheny River and tributaries receive .326 mgd in domestic sewage and .236 in industrial wastes. Most of this discharge is in the Oakland area.

B. Ground Water

1. Except for the Oakland service area, all of the domestic and municipal water used in the basin is obtained from ground water supplies and springs. There are five municipal systems using ground water; the remaining population is served by individual wells. All industrial water used in the basin is taken from ground water sources; total withdrawals average 374,000 gpd.

IV. Water Quality

1. Stretches of the Youghiogheny River and certain of its tributaries receive mine waste discharges, causing a degradation of water quality. In the past, the area most affected by mine effluent has been a four-mile reach of the river extending from Crellin to the mouth of the Little Youghiogheny River. These wastes originate from sources in West Virginia and cross into Maryland via Laurel Run and Snowy Creek. West Virginia has initiated corrective action which should result in an improvement in water quality in this area.

2. Within the Maryland portion of the basin, no effective program of reducing mine-waste effluent has yet been started. The extent of mine drainage in the basin is summarized in the following table:

	Total No. of Mine Sites	No. of Sites with Effluent Containing pH of 5.8 or less
Deep		
Active	10	4
Inactive	29	7
Strip		
Active	9	4
Inactive, Backfilled	27	17
Inactive, Not Backfilled	18	9
Deep-Strip Combination		
Active	3	1
Inactive, Backfilled	2	1
Inactive, Not Backfilled	5	4
Total	103	47

3. Except where septic systems are used, none of the domestic and municipal wastes in the Youghiogheny basin is treated. Water quality is adversely affected by untreated or partially treated discharge in the Little Youghiogheny River (Oakland, Mountain Lake Park and Loch Lynn Heights), in Bear Creek and the mainstem Youghiogheny near Friendsville (Accident and Friendsville) and in the Casselman River near Grantsville. To date, no corrective action has taken place in these areas.

4. The major source of industrial pollution in the basin has been the discharge from a poultry processing plant at the mouth of the Little Youghiogheny River. A treatment facility has recently been completed and now in operation.

V. General

1. The Maryland portion of the Youghiogheny basin is still largely rural with little industrial, commercial or extensive residential development, and, as such, imposes neither large nor conflicting demands on the water resources of the area. The only exceptions to this generally satisfactory situation are in those localized areas of poor water quality.
2. Meeting local supply and sewage treatment needs are primarily problems of finance and less of technique. In the case of the major acid mine waste contamination, technical and legal considerations as well as financing are involved.
3. Because of the resources available and the lack of conflicting development, recreation is of more importance in the Youghiogheny basin than any other comparable area in Maryland. Proposals for future recreational developments will extend this role further. With the Appalachia road building program in effect, a major limitation to maximum recreational use of the basin area will be removed. Recreation opportunity is of such significance in the Youghiogheny basin that it will be the most important criteria in determining other water and land development in the basin.

SUPPLEMENT

Selected Data* from Water Quality Survey of Youghiogheny River and Tributaries - September 6 - 8, 1966

Station No.	Location	pH	Dissolved Oxygen ppm	Coliform mpn/100ml	E. Coli mpn/100ml
1	North of Friendsville Island	7.8	10.2	4,300	930
3	Bear Creek at Friendsville	8.3	9.8	15,000	230
4	Friendsville Bridge	8.2	9.1	23,000	2,100
5	Laurel Run Bridge on Trap Run Road	7.9	8.1	2,300	230
7	Trap Run at Bridge	6.3	7.6	230	4
8	White Rock Run at Bridge	5.4	8.5	210	23
9	Salt Block Run	6.7	8.8	230	9
10	Youghiogheny River at Sang Run	7.9	9.1	430	230
11	Sang Run Creek at Sang Run	8.2	9.4	2,300	930
12	Youghiogheny River at Hoyes Run	7.9	6.3	23,000	3
13	Hoyes Run at Bridge	8.2	9.9	430	23
14	Deep Creek at Bridge	9.3	9.2	930	430
15	Muddy Creek above Falls	7.1	8.9	430	43
16	Swallow Falls Bridge	7.2	8.8	640	93
16A	Round Glade Run	7.2	7.9	230	93
17	Herrington Creek	6.9	8.8	2,300	230
18	Dunkard Lick	6.8	8.9	9,300	430
19	Youghiogheny River downstream of Little Youghiogheny Confluence	6.2	8.0	230,000	<3
20	Youghiogheny River at Crellin	4.5	8.2	230	<3
21	Snowy Creek downstream of Laurel Run	3.1	6.4	230	4
22	Laurel Run	2.5	8.0	430	<3
23	Snowy Creek upstream of Laurel Run	4.6	8.1	93	4
24	Youghiogheny River at Underwood Church	8.4	6.9	930	230
L1	Little Youghiogheny River - Foot Bridge	7.2	1.6	2,300,000	2,300,000
L2	Little Youghiogheny River - Bridge upstream of Sterling Processing Corp.	7.2	2.2	9,300,000	9,300,000
L3	Little Youghiogheny River - U. S. Route 219	7.8	8.8	43,000	2,300
L4	Little Youghiogheny River - upstream of Loch Lynn	8.1	7.8	23,000	23,000
L5	Little Youghiogheny River - Fricks Crossing	7.9	8.1	43,000	2,300
L6	Little Youghiogheny River - Deer Park	8.3	9.4	230,000	230,000

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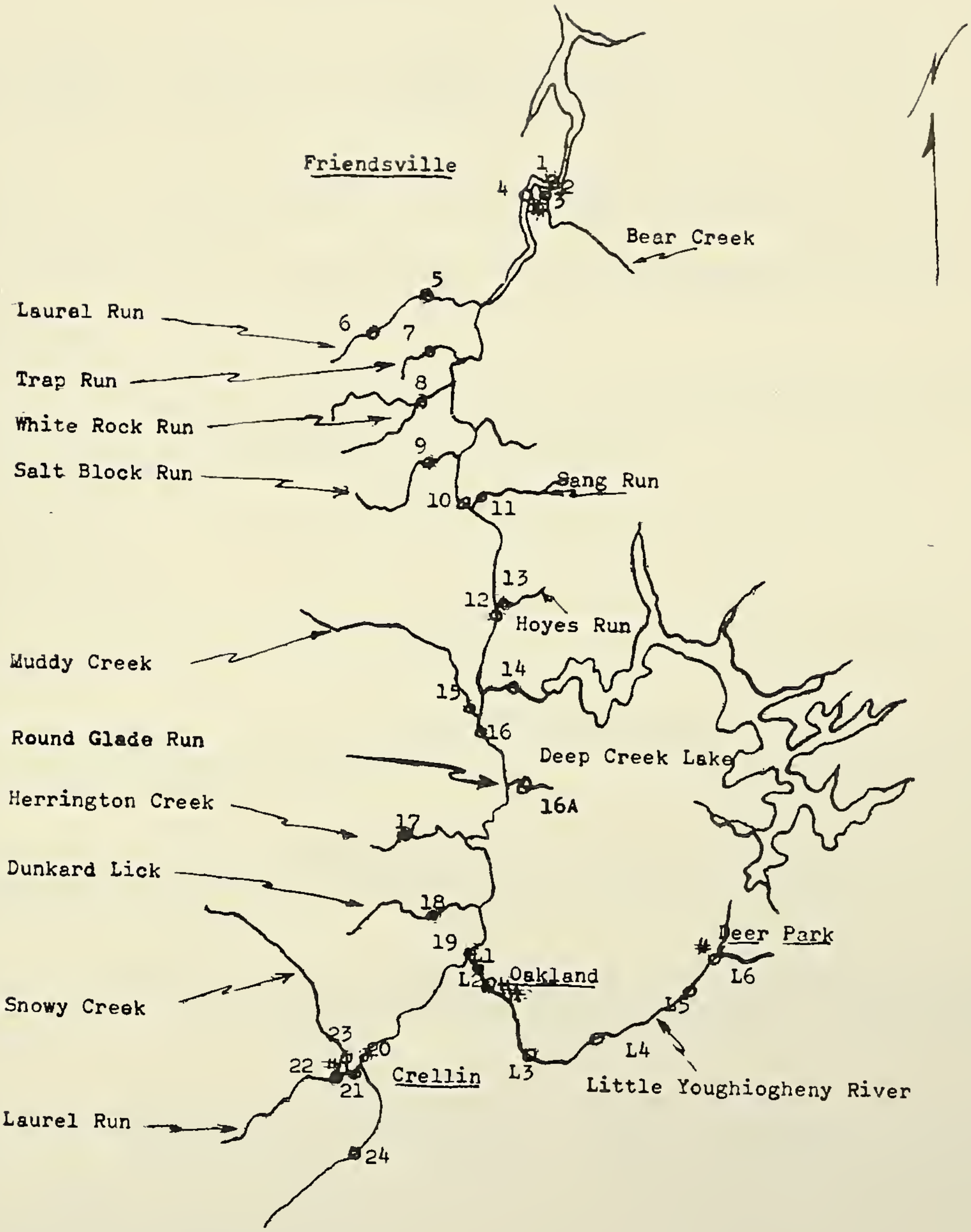
* Other measurements in survey conducted by Maryland Department of Water Resources included conductivity, acidity, alkalinity, hardness, and aluminum, manganese and iron concentrations.



YOUGHIOGHENY RIVER SURVEY STATIONS

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APPENDIX A

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

See Description of Appendices (Appendix A) in the General Reference Section for a narrative discussion of this material.

Appendix A

YOUGHIOGHENY RIVER DRAINAGE BASIN

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway) 1 2 3 4 5 6	LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
YOUGHIOGHENY RIVER	134.2/Head of Youghiogheny River in Garrett County, Maryland
YOUGHIOGHENY RIVER	134.0/State and County line, Upstream-Garrett County, Maryland Downstream - Preston County, West Virgini
YOUGHIOGHENY	133.0/Silver Lake
YOUGHIOGHENY RIVER	132.3/State and County line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland
YOUGHIOGHENY RIVER	131.6/Mouth of Sand Spring Run
Sand Spring Run	1.1/Head of Sand Spring Run
Sand Spring Run	0.0/Mouth of Sand Spring Run
YOUGHIOGHENY RIVER	131.6/Mouth of Sand Spring Run
YOUGHIOGHENY RIVER	129.6/Bridge, U.S. Highway #219
YOUGHIOGHENY RIVER	127.1/Mouth of Maple Run
Maple Run	___/Head of Maple Run, West Virginia
Maple Run	0.01/State and County line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland
Maple Run	0.0/Mouth of Maple Run
YOUGHIOGHENY RIVER	127.1/Mouth of Maple Run
YOUGHIOGHENY RIVER	127.1/State and County line, Upstream - Garrett County, Maryland Downstream - Preston County, West Virginia
YOUGHIOGHENY RIVER	126.8/Bridge, U.S. Highway #50
YOUGHIOGHENY RIVER	124.3/Mouth of Rhine Creek
Rhine Creek	___/Head of Rhine Creek
Rhine Creek	0.0/Mouth of Rhine Creek
YOUGHIOGHENY RIVER	124.3/Mouth of Rhine Creek
YOUGHIOGHENY RIVER	122.3/State and County Line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland (D. A. 32.8)
YOUGHIOGHENY RIVER	120.2/Mouth of Unnamed Tributary
Unnamed Tributary	2.1/Head of Unnamed Tributary
Unnamed Tributary	1.4/Mouth of Cherry Creek
Cherry Creek	5.5/Head of Cherry Creek
Cherry Creek	5.4/Bridge, U.S. Highway #50
Cherry Creek	4.0/Mouth of Fox Run
Fox Run	0.8/Head of Fox Run
Fox Run	0.0/Mouth of Fox Run
Cherry Creek	4.0/Mouth of Fox Run
Cherry Creek	2.7/Mouth of Clark Run
Clark Run	1.9/Head of Clark Run
Clark Run	1.5/Bridge, U.S. Highway #219

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)
1	2	3	4	5	6	1 2 3 4 5 6
			Clark Run			0.0/Mouth of Clark Run
		Cherry Creek				2.7/Mouth of Clark Run
		Cherry Creek				2.2/Mouth of Unnamed Tributary
			Unnamed Tributary			2.0/Head of Unnamed Tributary
			Unnamed Tributary			0.7/Mouth of Unnamed Tributary
				Unnamed Tributary		1.5/Head of Unnamed Tributary
				Unnamed Tributary		0.0/Mouth of Unnamed Tributary
			Unnamed Tributary			0.7/Mouth of Unnamed Tributary
			Unnamed Tributary			0.0/Mouth of Unnamed Tributary
		Cherry Creek				2.2/Mouth of Unnamed Tributary
		Cherry Creek				1.2/Mouth of Douglass Run
			Douglass Run			1.5/Head of Douglass Run
			Douglass Run			0.0/Mouth of Douglass Run
		Cherry Creek				1.2/Mouth of Douglass Run
		Cherry Creek				1.0/Mouth of Ambrose Run
			Ambrose Run			1.8/Head of Ambrose Run
			Ambrose Run			0.6/Bridge, U.S. Highway #219
			Ambrose Run			0.0/Mouth of Ambrose Run
		Cherry Creek				1.0/Mouth of Ambrose Run
		Cherry Creek				0.8/Bridge, U.S. Highway #219
		Cherry Creek				0.3/Mouth of Frozen Camp Run
			Frozen Camp Run			2.0/Head of Frozen Camp Run
			Frozen Camp Run			0.0/Mouth of Frozen Camp Run
		Cherry Creek				0.3/Mouth of Frozen Camp Run
		Cherry Creek				0.0/Mouth of Cherry Creek (D.A. 17.2)
	Unnamed Tributary					1.4/Mouth of Cherry Creek
	Unnamed Tributary					0.0/Mouth of Unnamed Tributary
YOUGHIOGHENY RIVER						120.2/Mouth of Unnamed Tributary
YOUGHIOGHENY RIVER						119.0/Mouth of Cherry Bottom Run
	Cherry Bottom Run					1.0/Head of Cherry Bottom Run
	Cherry Bottom Run					0.0/Mouth of Cherry Bottom Run
YOUGHIOGHENY RIVER						119.0/Mouth of Cherry Bottom Run
YOUGHIOGHENY RIVER						118.7/Mouth of Snowy Creek
	Snowy Creek					/Head of Snowy Creek
	Snowy Creek					3.7/State and County Line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland (D. A. 30.9)
	Snowy Creek					0.6/Mouth of Laurel Run
		Laurel Run				/Head of Laurel Run
		Laurel Run				1.4/State and County Line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland (D.A. 9.92)
		Laurel Run				0.0/Mouth of Laurel Run (D.A. 10.8)

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway) 1 2 3 4 5 6	LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
Snowy Creek	0.6/Mouth of Laurel Run
Snowy Creek	0.0/Mouth of Snowy Creek (D.A. 33.6)
YOUGHIOGHENY RIVER	118.7/Mouth of Snowy Creek
YOUGHIOGHENY RIVER	118.55/Water Stage recorder in Crellin (Abandaned 1947) (D.A. 89.3)
YOUGHIOGHENY RIVER	118.4/Bridge, Md. Highway #39
YOUGHIOGHENY RIVER	116.3/Mouth of Chisholm Run
Chisholm Run	1.0/Head of Chisholm Run
Chisholm Run	0.0/Mouth of Chisholm Run
YOUGHIOGHENY RIVER	116.3/Mouth of Chisholm Run
YOUGHIOGHENY RIVER	114.46/Intake, Oakland, Maryland (D.A. 134)
YOUGHIOGHENY RIVER	114.3/Mouth of Little Youghiogheny River
Little Youghiogheny River	11.1/Head of Little Youghiogheny River
Little Youghiogheny River	11.1/Mouth of Unnamed North Fork
Unnamed North Fork	1.7/Head of Unnamed North Fork
Unnamed North Fork	0.0/Mouth of Unnamed North Fork
Little Youghiogheny River	11.1/Mouth of Unnamed North Fork
Little Youghiogheny River	11.1/Mouth of Unnamed South Fork
Unnamed South Fork	1.5/Head of Unnamed South Fork
Unnamed South Fork	0.0/Mouth of Unnamed South Fork
Little Youghiogheny River	11.1/Mouth of Unnamed South Fork
Little Youghiogheny River	10.4/SCS Impoundment #7 (D.A. 0.72)
Little Youghiogheny River	9.2/Mouth of Block Run
Block Run	3.9/Head of Block
Block Run	0.0/Mouth of Block Run
Little Youghiogheny River	9.2/Mouth of Block Run
Little Youghiogheny River	5.6/Mouth of Broad Ford Run
Broad Ford Run	5.7/Head of Broad Ford Run
Broad Ford Run	0.6/Proposed SCS Impoundment #6 (D. A. 6.82)
Broad Ford Run	0.1/Mountain Lake
Broad Ford Run	0.0/Mouth of Broad Ford Run
Little Youghiogheny River	5.6/Mouth of Broad Ford Run
Little Youghiogheny River	5.56/Outfall, Mountain Lake Park
Little Youghiogheny River	5.17/Outfall, Mountain Lake Park
Little Youghiogheny River	5.15/Outfall, Mountain Lake Park
Little Youghiogheny River	5.13/Outfall, Mountain Lake Park
Little Youghiogheny River	4.99/Outfall, Lock Lynn Heights
Little Youghiogheny River	4.1/Mouth of Unnamed Tributary
Unnamed Tributary	/Head of Unnamed Tributary
Unnamed Tributary	1.67/Proposed SCS Impoundment #5 (D. A. 3.36)
Unnamed Tributary	0.04/Outfall, Mountain Lake Park
Unnamed Tributary	0.0/Mouth of Unnamed Tributary
Little Youghiogheny River	4.1/Mouth of Unnamed Tributary
Little Youghiogheny River	3.8/Mouth of Trout Run

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway) 1 2 3 4 5 6	LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
Trout Run	2.7/Head of Trout Run
Trout Run	0.0/Mouth of Trout Run
Little Youghiogheny River	3.8/Mouth of Trout Run
Little Youghiogheny River	3.2/Bridge, U.S. 219
Little Youghiogheny River	2.3/Mouth of Cotton Run
Cotton Run	1.1/Head of Cotton Run
Cotton Run	0.0/Mouth of Cotton Run
Little Youghiogheny River	2.3/Mouth of Cotton Run
Little Youghiogheny River	2.14/Mouth of Unnamed Tributary
Unnamed Tributary	1.6/Head of Unnamed Tributary
Unnamed Tributary	0.7/Outfall, Oakland, Maryland
Unnamed Tributary	0.0/Mouth of Unnamed Tributary
Little Youghiogheny River	2.14/Mouth of Unnamed Tributary
Little Youghiogheny River	1.44/Mouth of Wilson Run
Wilson Run	2.1/Head of Wilson Run
Wilson Run	1.6/SCS Impoundment #3 (D.A. 0.80)
Wilson Run	0.7/Mouth of Cherry Glade Run
Cherry Glade Run	1.4/Head of Cherry Glade Run
Cherry Glade Run	1.2/SCS Impoundment #2 (D.A. 0.48)
Cherry Glade Run	0.9/Bridge, U.S. #219
Cherry Glade Run	0.4/Bridge, Fourth Street near Oakland
Cherry Glade Run	0.2/SCS Impoundment #1 (D.A. 0.63)
Cherry Glade Run	0.0/Mouth of Cherry Glade Run
Wilson Run	0.7/Mouth of Cherry Glade Run
Wilson Run	0.0/Mouth of Wilson Run
Little Youghiogheny River	1.44/Mouth of Wilson Run
Little Youghiogheny River	1.18/Outfall, Oakland
Little Youghiogheny River	1.06/Outfall, Oakland (Sterling Poultry Co.)
Little Youghiogheny River	0.34/Mouth of Bradley Run
Bradley Run	1.5/Head of Bradley Run
Bradley Run	0.0/Mouth of Bradley Run
Little Youghiogheny River	0.34/Mouth of Bradley Run
Little Youghiogheny River	0.0/Mouth of Little Youghiogheny River (D. A. 40.5)
YOUGHIOGHENY RIVER	114.3/Mouth of Little Youghiogheny River
YOUGHIOGHENY RIVER	114.25/Gaging Station, Oakland, Maryland (D. A. 134.0)
YOUGHIOGHENY RIVER	112.5/Mouth of Dunkard Lick Run
Dunkard Lick Run	3.8/Head of Dunkard Lick Run
Dunkard Lick Run	0.0/Mouth of Dunkard Lick Run
YOUGHIOGHENY RIVER	112.5/Mouth of Dunkard Lick Run
YOUGHIOGHENY RIVER	111.3/Mouth of Millers Run
Millers Run	1.5/Head of Millers Run

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)					
1	2	3	4	5	6	1	2	3	4	5	6
	Millers Run						0.2/Oakland - Sang Run Road				
	Millers Run						0.0/Mouth of Millers Run				
YOUGHIOGHENY RIVER						111.3/Mouth of Millers Run					
YOUGHIOGHENY RIVER						110.2/Mouth of Herrington Creek					
	Herrington Creek						6.1/Head of Herrington Creek				
	Herrington Creek						4.2/Upper end of Lake Koshare				
	Herrington Creek						4.0/Lower end of Lake Koshare				
	Herrington Creek						3.8/Upper end of Herrington Lake				
	Herrington Creek						2.1/Lower end of Herrington Lake				
	Herrington Creek						1.3/Mouth of Murley Run				
		Murley Run						2.1/Head of Murley Run			
		Murley Run						1.1/Mouth of Bull Glade Run			
			Bull Glade Run						2.7/Head of Bull Glade Run		
			Bull Glade Run						1.3/Mouth of Unnamed Tributary		
				Unnamed Tributary						2.5/Head of Unnamed Tributary	
				Unnamed Tributary						0.0/Mouth of Unnamed Tributary	
			Bull Glade Run						1.3/Mouth of Unnamed Tributary		
			Bull Glade Run						0.0/Mouth of Bull Glade Run		
		Murley Run						1.1/Mouth of Bull Glade Run			
		Murley Run						0.0/Mouth of Murley Run			
	Herrington Creek						1.3/Mouth of Murley Run				
	Herrington Creek						0.0/Mouth of Herrington Creek				
YOUGHIOGHENY RIVER						110.2/Mouth of Herrington Creek					
YOUGHIOGHENY RIVER						108.6/Mouth of Round Glade Run					
	Round Glade Run						1.5/Head of Round Glade Run				
	Round Glade Run						0.0/Mouth of Round Glade Run				
YOUGHIOGHENY RIVER						108.6/Mouth of Round Glade Run					
YOUGHIOGHENY RIVER						106.8/Mouth of Tolivar Run					
	Tolivar Run						3.2/Head of Tolivar Run				
	Tolivar Run						0.0/Mouth of Tolivar Run				
YOUGHIOGHENY RIVER						106.8/Mouth of Tolivar Run					
YOUGHIOGHENY RIVER						106.75/Swallow Falls (D.A. 162.0)					
YOUGHIOGHENY RIVER						106.4/Mouth of Muddy Creek					
	Muddy Creek						10.8/Head of Muddy Creek				
	Muddy Creek						10.8/Mouth of Ned Run				
		Ned Run						1.1/Head of Med Run			
		New Run						0.0/Mouth of Ned Run			
	Muddy Creek						10.8/Mouth of Ned Run				
	Muddy Creek						9.2/State and County Line, Upstream - Preston Co., W. Va., Downstream - Garrett Co., Md.				
	Muddy Creek						5.5/Mouth of Browning Run				
		Browning Run						/Head of Browning Run			
		Browning Run						0.2/State and County Line, Upstream - Preston Co., W. Va., Downstream - Garrett Co., Md.			
		Browning Run						0.0/Mouth of Browning Run			
	Muddy Creek						5.5/Mouth of Browning Run				
	Muddy Creek						4.8/Mouth of White Oak Springs Run				
		White Oak Springs Run						1.9/Head of White Oak Springs Run			
		White Oak Springs Run						1.5/Mouth of Cupp Run			
			Cupp Run						/Head of Cupp Run		
			Cupp Run						0.0/Mouth of Cupp Run		

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)					
1	2	3	4	5	6	1	2	3	4	5	6
		White Oak Springs						1.5/Mouth of Cupp Run			
		White Oak Springs Run						1.0/State and County Line, Upstream - Preston County, West Virgina Downstream - Garrett County, Maryland			
		White Oak Springs Run						0.5/Mouth of Hoyes Run			
			Hoyes Run						/Head of Hoyes Run		
			Hoyes Run						0.1/State and County Line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland		
			Hoyes Run						0.0/Mouth of Hoyes Run		
		White Oak Springs Run						0.5/Mouth of Hoyes Run			
		White Oak Springs Run						0.0/Mouth of White Oak Springs Run			
	Muddy Creek						4.8/Mouth of White Oak Springs Run				
	Muddy Creek						3.8/Browning Dam				
	Muddy Creek						2.3/Mouth of Piney Run				
		Piney Run						2.0/Head of Piney Run			
		Piney Run						0.0/Mouth of Piney Run			
	Muddy Creek						2.3/Mouth of Piney Run				
	Muddy Creek						0.0/Mouth of Muddy Creek				
YOUGHIOGHENY RIVER						106.4/Mouth of Muddy Creek					
YOUGHIOGHENY RIVER						106.0/Mouth of Deep Creek					
	Deep Creek						12.6/Head of Deep Creek				
	Deep Creek						10.8/Upper end of Deep Creek Lake				
	Deep Creek						9.9/Mouth of Unnamed Cove				
		Unnamed Cove						1.0/Head of Unnamed Cove			
		Unnamed Cove						1.0/Mouth of Pawn Run			
			Pawn Run						2.0/Head of Pawn Run		
			Pawn Run						0.0/Mouth of Pawn Run		
		Unnamed Cove						1.0/Mouth of Pawn Run			
		Unnamed Cove						0.0/Mouth of Unnamed Cove			
	Deep Creek						9.9/Mouth of Unnamed Cove				
	Deep Creek						8.6/Mouth of Unnamed Cove				
		Unnamed Cove						/Head of Unnamed Cove			
		Unnamed Cove						1.0/Green Glade Cove			
		Unnamed Cove						0.0/Mouth of Unnamed Cove			
	Deep Creek						8.6/Mouth of Unnamed Cove				
	Deep Creek						7.5/Mouth of Unnamed Cove				
		Unnamed Cove						1.2/Head of Unnamed Cove			
		Unnamed Cove						1.2/Mouth of Hoop Pole Run			
			Hoop Pole Run						0.6/Head of Hoop Pole Run		
			Hoop Pole Run						0.0/Mouth of Hoop Pole Run		
		Unnamed Cove						1.2/Mouth of Hoop Pole Run			
		Unnamed Cove						0.0/Mouth of Unnamed Cove			
	Deep Creek						7.5/Mouth of Unnamed Cove				

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
1	2	3	4	5	6	
	Deep Creek					7.45/Mouth of North Glade Cove
		North Glade Cove				2.7/Head of North Glade Cove
		North Glade Cove				2.7/Mouth of North Glade Run
			North Glade Run			2.5/Head of North Glade Run
			North Glade Run			0.0/Mouth of North Glade Run
		North Glade Cove				2.7/Mouth of North Glade Run
		North Glade Cove				0.0/Mouth of North Glade Cove
	Deep Creek					7.45/Mouth of North Glade Cove
	Deep Creek					5.7/Bridge, Glendale Bridge
	Deep Creek					5.3/Mouth of Meadow Mountain Run
		Meadow Mountain Run				4.6/Head of Meadow Mountain Run
		Meadow Mountain Run				0.0/Mouth of Meadow Mountain Run
	Deep Creek					5.3/Mouth of Meadow Mountain Run
	Deep Creek					4.7/Mouth of Cherry Creek Cove
		Cherry Creek Cove				1.14/Head of Cherry Creek Cove
		Cherry Creek Cove				1.14/Mouth of Cherry Creek
			Cherry Creek			7.86/Head of Cherry Creek
			Cherry Creek			0.0/Mouth of Cherry Creek
		Cherry Creek Cove				1.14/Mouth of Cherry Creek
		Cherry Creek Cove				0.0/Mouth of Cherry Creek Cove
	Deep Creek					4.7/Mouth of Cherry Creek Cove
	Deep Creek					4.0/Bridge, Deep Creek Bridge
	Deep Creek					3.8/Mouth of Marsh Run Cove
		Marsh Run Cove				1.9/Head of Marsh Run Cove
		Marsh Run Cove				0.0/Mouth of Marsh Run Cove
	Deep Creek					3.8/Mouth of Marsh Run Cove
	Deep Creek					1.8/Mouth of Red Run Cove
		Red Run Cove				0.7/Head of Red Run Cove
		Red Run Cove				0.0/Mouth of Red Run Cove
	Deep Creek					1.8/Mouth of Red Run Cove
	Deep Creek					2.0/Lower end of Deep Creek Lake (D. A. 64.7)
	Deep Creek					0.0/Mouth of Deep Creek (D.A. 66.6)
YOUGHIOGHENY RIVER						106.0/Mouth of Deep Creek
YOUGHIOGHENY RIVER						104.1/Mouth of Hoyes Run
	Hoyes Run					2.9/Head of Hoyes Run
	Hoyes Run					0.9/Mouth of Fork Run
		Fork Run				1.9/Head of Fork Run
		Fork Run				0.0/Mouth of Fork Run
	Hoyes Run					0.9/Mouth of Fork Run
	Hoyes Run					0.0/Mouth of Hoyes Run
YOUGHIOGHENY RIVER						104.1/Mouth of Hoyes Run
YOUGHIOGHENY RIVER						102.2/Mouth of Steep Run
	Steep Run					1.0/Head of Steep Run
	Steep Run					0.0/Mouth of Steep Run

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway) 1 2 3 4 5 6	LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
YOUGHIOGHENY RIVER	102.2/Mouth of Steep Run
YOUGHIOGHENY RIVER	101.2/Mouth of Ginseng Run
Ginseng Run	3.4/Head of Ginseng Run
Ginseng Run	0.0/Mouth of Ginseng Run
YOUGHIOGHENY RIVER	101.2/Mouth of Ginseng Run (D.A. 260)
YOUGHIOGHENY RIVER	99.6/Mouth of Salt Block Run
Salt Block Run	/Head of Salt Block Run
Salt Block Run	3.9/State and County Line, Upstream- Preston County, West Virginia Downstream - Garrett County, Maryland
Salt Block Run	0.0/Mouth of Salt Block Run
YOUGHIOGHENY RIVER	99.6/Mouth of Salt Block Run
YOUGHIOGHENY RIVER	98.8/Mouth of Gap Run
Gap Run	3.4/Head of Gap Run
Gap Run	0.0/Mouth of Gap Run
YOUGHIOGHENY RIVER	98.8/Mouth of Gap Run
YOUGHIOGHENY RIVER	98.7/Gap Falls
YOUGHIOGHENY RIVER	97.2/Mouth of White Rock Run
White Rock Run	2.7/Head of White Rock Run
White Rock Run	1.9/Mouth of White Rock Glade
White Rock Glade	2.7/Head of White Rock Glade
White Rock Glade	1.8/State Line, Upstream - West Virginia Downstream - Maryland
White Rock Glade	0.0/Mouth of White Rock Glade
White Rock Run	1.9/Mouth of White Rock Glade
White Rock Run	0.0/Mouth of White Rock Run
YOUGHIOGHENY RIVER	97.2/Mouth of White Rock Run
YOUGHIOGHENY RIVER	96.7/Mouth of Trap Run
Trap Run	1.4/Head of Trap Run
Trap Run	0.0/Mouth of Trap Run
YOUGHIOGHENY RIVER	96.7/Mouth of Trap Run
YOUGHIOGHENY RIVER	94.8/Mouth of Laurel Run
Laurel Run	2.6/Head of Laurel Run
Laurel Run	0.0/Mouth of Laurel Run
YOUGHIOGHENY RIVER	94.8/Mouth of Laurel Run
YOUGHIOGHENY RIVER	92.4/Gaging Station at Friendsville, Maryland (D. A. 295)
YOUGHIOGHENY RIVER	91.8/Bridge, Maryland Route #42 at Friendsville (D.A. 297.6)
YOUGHIOGHENY RIVER	91.0/Mouth of Bear Creek
Bear Creek	17.0/Head of Bear Creek
Bear Creek	8.2/Mouth of Little Bear Creek
Little Bear Creek	3.6/Head of Little Bear Creek
Little Bear Creek	0.0/Mouth of Little Bear Creek

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
1	2	3	4	5	6	
	Bear Creek					8.2/Mouth of Little Bear Creek
	Bear Creek					7.1/Bridge, U.S. Highway #219
	Bear Creek					6.6/Mouth of Cove Run
		Cove Run				2.9/Head of Cove Run
		Cove Run				0.0/Mouth of Cove Run
	Bear Creek					6.6/Mouth of Cove Run
	Bear Creek					5.1/Mouth of Fikes Run
		Fikes Run				2.6/Head of Fikes Run
		Fikes Run				0.0/Mouth of Fikes Run
	Bear Creek					5.1/Mouth of Fikes Run
	Bear Creek					1.7/Mouth of South Branch Bear Creek
		South Branch Bear Creek				7.7/Head of South Branch Bear Creek
		South Branch Bear Creek				5.6/Bridge, U.S. Highway #219
		South Branch Bear Creek				3.7/Mouth of Rocklick Creek
			Rocklick Creek			4.2/Head of Rocklick Creek
			Rocklick Creek			0.0/Mouth of Rocklick Creek
		South Branch Bear Creek				3.7/Mouth of Rocklick Creek
		South Branch Bear Creek				0.0/Mouth of South Branch Bear Creek
	Bear Creek					1.7/Mouth of South Branch Bear Creek
	Bear Creek					0.0/Mouth of Bear Creek (D.A. 50.5)
YOUGHIOGHENY RIVER						91.0/Mouth of Bear Creek
YOUGHIOGHENY RIVER						87.8/Mouth of Buffalo Run
	Buffalo Run					14.8/Head of Buffalo Run in Preston County, West Virginia
	Buffalo Run					9.2/State and County Line, Upstream - Preston County, West Virginia Downstream - Garrett County, Maryland
	Buffalo Run					7.0/Mouth of Stony Run
		Stony Run				1.7/Head of Stony Run, West Virginia
		Stony Run				0.9/State Line, Upstream - West Virginia Downstream - Maryland
		Stony Run				0.0/Mouth of Stony Run
	Buffalo Run					7.0/Mouth of Stony Run
	Buffalo Run					6.1/Mouth of Little Buffalo Run
		Little Buffalo Run				0.9/Head of Little Buffalo Run
		Little Buffalo Run				0.0/Mouth of Little Buffalo Run
	Buffalo Run					6.1/Mouth of Little Buffalo Run
	Buffalo Run					3.3/Mouth of Laurel Run
		Laurel Run				0.6/Head of Laurel Run
		Laurel Run				0.6/Mouth of North Branch
			North Branch			1.7/Head of North Branch
			North Branch			0.0/Mouth of North Branch
		Laurel Run				0.6/Mouth of North Branch
		Laurel Run				0.6/Mouth of South Branch
			South Branch			2.2/Head of South Branch, West Virginia

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)					
1	2	3	4	5	6	1	2	3	4	5	6
			South Branch						1.8/State Line, Upstream - West Virginia Downstream - Maryland		
			South Branch						0.0/Mouth of South Branch		
		Laurel Run						0.6/Mouth of South Branch			
		Laurel Run						0.0/Mouth of Laurel Run			
	Buffalo Run						3.3/Mouth of Laurel Run				
	Buffalo Run						0.0/Mouth of Buffalo Run (D.A. 22.6)				
YOUGHIOGHENY RIVER						87.8/Mouth of Buffalo Run					
YOUGHIOGHENY RIVER						86.7/Mouth of Mill Run					
	Mill Run						8.4/Head of Mill Run				
	Mill Run						3.4/Mouth of Cove Run				
		Cove Run						2.8/Head of Cove Run			
		Cove Run						0.0/Mouth of Cove Run			
	Mill Run						3.4/Mouth of Cove Run				
	Mill Run						0.0/Mouth of Mill Run (D.A. 18.5)				
YOUGHIOGHENY RIVER						86.7/Mouth of Mill Run					
YOUGHIOGHENY RIVER						86.3/State and County Line, Upstream - Garrett County, Maryland Downstream - Fayette & Somerset Counties, Pennsylvannia (D.A. 397)					
YOUGHIOGHENY RIVER						81.5/Bridge, U.S. 40					
YOUGHIOGHENY RIVER						74.05/Dam, Youghiogheny River Reservoir (D.A. 434)					
YOUGHIOGHENY RIVER						73.8/Gaging Station at Youghiogheny River Dam, Pennsylvania (D.A. 436.0)					
YOUGHIOGHENY RIVER						73.1/Mouth of Casselman River					
	Casselman River						53.5/Head of Casselman River, Maryland				
	Casselman River						53.5/Mouth of North Branch Casselman River				
		North Branch Casselman River						6.6/Head of North Branch Casselman River			
		North Branch Casselman River						3.2/Mouth of Alexander Run			
			Alexander Run						1.5/Head of Alexander Run		
			Alexander Run						0.0/Mouth of Alexander Run		
		North Branch Casselman River						3.2/Mouth of Alexander Run			
		North Branch Casselman River						3.0/Mouth of Unnamed Tributary			
			Unnamed Tributary						1.4/Head of Unnamed Tributary		
			Unnamed Tributary						0.0/Mouth of Unnamed Tributary		
		North Branch Casselman River						3.0/Mouth of Unnamed Tributary			
		North Branch Casselman River						1.7/Mouth of Tarkiln Run			
			Tarkiln Run						1.0/Head of Tarkiln Run		
			Tarkiln Run						0.0/Mouth of Tarkiln Run		
		North Branch Casselman River						1.7/Mouth of Tarkiln Run			
		North Branch Casselman River						0.6/Mouth of Unnamed Tributary			
			Unnamed Tributary						2.2/Head of Unnamed Tributary		
			Unnamed Tributary						0.0/Mouth of Unnamed Tributary		
		North Branch Casselman River						0.6/Mouth of Unnamed Tributary			

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway) 1 2 3 4 5 6	LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway) 1 2 3 4 5 6
North Branch Casselman River	0.0/Mouth of North Branch Casselman River (D. A. 25.2)
Casselman River	53.5/Mouth of North Branch Casselman River
Casselman River	53.5/Mouth of South Branch Casselman River
South Branch Casselman River	10.0/Head of South Branch Casselman River
South Branch Casselman River	1.9/Mouth of Little Laurel Run
South Branch Casselman River	
Little Laurel Run	2.3/Head of Little Laurel Run
Little Laurel Run	0.0/Mouth of Little Laurel Run
South Branch Casselman River	1.9/Mouth of Little Laurel Run
South Branch Casselman River	1.7/Mouth of Big Laurel Run
Big Laurel Run	4.0/Head of Big Laurel Run
Big Laurel Run	0.0/Mouth of Big Laurel Run
South Branch Casselman River	1.7/Mouth of Big Laurel Run
South Branch Casselman River	0.0/Mouth of South Branch Casselman River (D. A. 20.3)
Casselman River	53.5/Mouth of South Branch Casselman River
Casselman River	52.4/Mouth of Spiker Run
Spiker Run	2.7/Head of Spiker Run
Spiker Run	0.1/Bridge, Md. Highway #495
Spiker Run	0.0/Mouth of Spiker Run
Casselman River	52.4/Mouth of Spiker Run
Casselman River	51.9/Mouth of Shade Run
Shade Run	0.5/Head of Shade Run
Shade Run	0.5/Mouth of Little Shade Run
Little Shade Run	2.9/Head of Little Shade Run, Pennsylvania
Little Shade Run	2.7/State Line, Upstream - Pennsylvania Downstream - Maryland
Little Shade Run	0.4/Bridge, U.S. Highway #40
Little Shade Run	0.0/Mouth of Little Shade Run
Shade Run	0.5/Mouth of Little Shade Run
Shade Run	0.5/Mouth of Big Shade Run
Big Shade Run	____/Head of Big Shade Run, Pennsylvania
Big Shade Run	2.6/State Line, Upstream - Pennsylvania Downstream - Maryland
Big Shade Run	0.3/Bridge, U.S. Highway #40
Big Shade Run	0.0/Mouth of Big Shade Run
Shade Run	0.5/Mouth of Big Shade Run
Shade Run	0.2/Bridge, Md. Highway #495
Shade Run	0.0/Mouth of Shade Run
Casselman River	51.9/Mouth of Shade Run
Casselman River	49.6/Mouth of Schoolhouse Run

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)
1	2	3	4	5	6	1 2 3 4 5 6
		Schoolhouse Run				1.0/Head of Schoolhouse Run
		Schoolhouse Run				0.0/Mouth of Schoolhouse Run
	Casselman River					49.6/Mouth of Schoolhouse Run
	Casselman River					48.8/Bridge, U. S. Highway #40
	Casselman River					47.8/Mouth of Slaubaugh Run
		Slaubaugh Run				1.5/Head of Slaubaugh Run
		Slaubaugh Run				___/Outfall, Yoders Locker Plant
		Slaubaugh Run				0.0/Mouth of Slaubaugh Run
	Casselman River					47.8/Mouth of Slaubaugh Run
	Casselman River					____/Outfall, Grantsville, Maryland
	Casselman River					____/Outfall, Harbison-Walker Refractories, Grantsville
	Casselman River					48.1/Gaging Station at Grantsville, Maryland (D. A. 62.5)
	Casselman River					47.8/Mouth of Slaubaugh Run
	Casselman River					47.2/Mouth of Crab Run
		Crab Run				1.3/Head of Crab Run
		Crab Run				0.0/Mouth of Crab Run
	Casselman River					47.2/Mouth of Crab Run
	Casselman River					45.9/State Line, Upstream - Maryland Downstream - Pennsylvania (D.A. 68.7)
	Casselman River					45.1/Mouth of Flag Run
		Flag Run				2.0/Head of Flag Run
		Flag Run				0.0/Mouth of Flag Run
	Casselman River					45.1/Mouth of Flag Run
	Casselman River					43.0/Mouth of Meadow Run
		Meadow Run				6.8/Head of Meadow Run, Maryland
		Meadow Run				5.3/Bridge, U.S. Highway #40
		Meadow Run				2.5/State & County Line, Upstream - Garrett Co., Maryland Downstream - Somerset County, Pennsylvania
		Meadow Run				0.6/Bridge, U.S. Highway #219
		Meadow Run				0.0/Mouth of Meadow Run
	Casselman River					43.0/Mouth of Meadow Run
	Casselman River					41.0/Mouth of Piney Creek
		Piney Creek				13.0/Head of Piney Creek, Maryland
		Piney Creek				11.2/State Line, Upstream - Maryland Downstream - Pennsylvania
		Piney Creek				9.5/State Line, Uptream - Pennsylvania Downstream- Maryland
		Piney Creek				8.6/Mouth of Unnamed Tributary
			Unnamed Tributary			2.3/Head of Unnamed Tributary
			Unnamed Tributary			0.0/Mouth of Unnamed Tributary
		Piney Creek				8.6/Mouth of Unnamed Tributary
		Piney Creek				7.6/Frostburg Reservoir
		Piney Creek				7.0/Mouth of Church Run

YOUGHIOGHENY RIVER DRAINAGE BASIN

DISTANCES FROM MOUTH OF WATERWAY AND DRAINAGE AREAS FOR SPECIFIC LOCATIONS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)						LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)					
1	2	3	4	5	6	1	2	3	4	5	6
			Church Run						1.0/Head of Church Run		
			Church Run						0.0/Mouth of Church Run		
		Piney Creek						7.0/Mouth of Church Run			
		Piney Creek						6.6/Mouth of Twomile Run			
			Twomile Run						3.3/Head of Twomile Run		
			Twomile Tun						2.3/Bridge, U.S. Highway #40		
			Twomile Run						0.0/Mouth of Twomile Run		
		Piney Creek						6.6/Mouth of Twomile Run			
		Piney Creek						4.1/Mouth of Red Run			
			Red Run						3.8/Head of Red Run		
			Red Run						0.0/Mouth of Red Run		
		Piney Creek						4.1/Mouth of Red Run			
		Piney Creek						4.1/State Line, Upstream - Garrett County, Maryland Downstream - Somerset County, Pennsylvania			
		Piney Creek						3.9/Gaging Station near Salisbury, Pennsylvania (D.A. 24.5)			
		Piney Creek						3.8/Mouth of Little Piney Creek			
			Little Piney Creek						4.8/Head of Little Piney Creek		
			Little Piney Creek						0.0/Mouth of Little Piney Creek		
		Piney Creek						3.8/Mouth of Little Piney Creek			
		Piney Creek						0.0/Mouth of Piney Creek			
	Casselman River						41.0/Mouth of Piney Creek				
	Casselman River						14.5/Gaging Station at Markleton, Pennsylvania (D.A. 382)*				
	Casselman River						0.2/Mouth of Laurel Hill Creek				
		Laurel Hill Creek						____/Head of Laurel Hill Creek, Pennsylvania			
		Laurel Hill Creek						2.7/Gaging Station at Ursina, Pennsylvania (D.A. 121)			
		Laurel Hill Creek						0.0/Mouth of Laurel Hill Creek			
	Casselman River						0.2/Mouth of Laurel Hill Creek				
	Casselman River						0.0/Mouth of Casselman River (D.A. 576)				
YOUGHIOGHENY RIVER						73.0/Mouth of Casselman River					
YOUGHIOGHENY RIVER						72.0/Gaging Station below Confluence, Pennsylvania (D.A. 1,029)					
YOUGHIOGHENY RIVER						____/Gaging Station at Connellsville, Pennsylvania (D.A. 1,326)					
YOUGHIOGHENY RIVER						12.4/Gaging Station at Sutersville, Pennsylvania (D.A. 1,715)					
YOUGHIOGHENY RIVER						0.0/Mouth of Youghiogheny River** (D. A. 1768.0)					

D.A. Drainage Area, square mile.
*Approximate mileage point
**Youghiogheny River joins Monongahela River at McKeesport, Pennsylvania, 15.4 miles above head of Ohio River.

January, 1965

APPENDIX B

WATER-QUALITY STATIONS, WATER WITHDRAWN, WASTES DISCHARGED AND STREAMFLOWS

See Description of Appendices (Appendix B) in the General Reference Section for a narrative discussion of this material.

Appendix B

YOUGHIOGHENY RIVER DRAINAGE BASIN

WATER-QUALITY STATIONS, WATER WITHDRAWN, WASTES DISCHARGED, AND STREAM FLOWS

MAIN WATERWAYS AND TRIBUTARIES (Magnitude of Waterway)	LOCATION: RIVER MILE/DESCRIPTION (Magnitude of Waterway)	Water intake mgd	Waste discharge mgd	Daily Stream Flow cfs	
1 2 3 4 5 6	1 - 2 - 3 - 4 - 5 - 6			Minimum	Lower 5 Percentile
YOUGHIOGHENY RIVER	114.46/Intake, Oakland	0.250			
Little Youghiogheny River	114.3 - 5.56/Outfall, Mt. Lake Park		0.016		
Little Youghiogheny River	114.3 - 5.17/Outfall, Mt. Lake Park		0.026		
Little Youghiogheny River	114.3 - 5.15/Outfall, Mt. Lake Park		0.001		
Little Youghiogheny River	114.3 - 5.13/Outfall, Mt. Lake Park		0.001		
Little Youghiogheny River	114.3 - 4.99/Outfall, Loch Lynn Heights		0.019		
Unnamed Tributary	114.3 - 4.1 -0.04/Outfall, Mt. Lake Park		0.032		
Unnamed Tributary	114.3 - 2.14-0.7 /Outfall, Oakland		0.009		
Little Youghiogheny River	114.3 - 1.18/Outfall, Oakland		0.202		
Little Youghiogheny River	114.3 - 1.06/Outfall, Oakland (Sterling Poultry Company)		0.221		
YOUGHIOGHENY RIVER	114.25/Gaging Station near Oakland			2.5	13.0
YOUGHIOGHENY RIVER	92.4 /Gaging Station at Friendsville[1]			10.0	97.0
YOUGHIOGHENY RIVER	______/Outfalls (4) Friendsville, Md.[1]		X		
Bear Creek	91.6 - ____/Outfalls, (2) Friendsville[1]		X		
YOUGHIOGHENY RIVER	73.8 /Gaging Station at Youghiogheny River Dam (Pa.)			X	X
Casselman River	73.1 -48.1*/Outfall, Grantsville, Md.		0.020		
Casselman River	73.0 -48.1*/Outfall, Harbison-Walker Refractories, Grantsville		0.001		
Casselman River	73.0 -48.1*/Gaging Station at Grantsville			0.3	4.6
Slaubaugh Run	73.0 -47.8 -____/Outfall, Yoders Locker Plant, Grantsville		0.010		
Piney Creek	73.0 -41.0 -7.6 /Intake, Frostburg	X			
Piney Creek	73.0 -41.0 -3.9 /Gaging Station near Salisbury, Pa.			0.08	0.7
Casselman River	73.0 -14.5*/Gaging Station at Markelton			10.0	
Laurel Hill Creek	73.0 - 0.2 -2.7 /Gaging Station at Ursina, Pa.			2.20	
YOUGHIOGHENY RIVER	72.0 /Gaging Station below Confluence, Pa.			121.0[2]	
YOUGHIOGHENY RIVER	______/Gaging Station at Connellsville, Pa.			11.0[3]	
YOUGHIOGHENY RIVER	12.4 /Gaging Station at Sutersville, Pa.			57.0[4]	

Footnotes:

* Approximate mileage point
1/ Friendsville discharge sewage from 4 outfalls to the Youghiogheny River and 2 outfalls to Bear Creek (milepoints and quantity unknown).
2/ 19 years of record
3/ 51 years of record
4/ 39 years of record
X Data not available

APPENDIX C

RESERVOIRS, LAKES AND PONDS

See Description of Appendices (Appendix C) in the General Reference Section for a narrative discussion of this material.

APPENDIX C

RESERVOIRS, LAKES AND PONDS IN YOUGHIOGHENY RIVER DRAINAGE BASIN, MARYLAND

Stream	Reservoir, Lake, or Pond	Water Surface Area, acres	Location of Dam	
			County	Maryland Coordinates
Youghiogheny River	Silver Lake	--	Preston, W.Va.	095-527
Little Youghiogheny R.	SCS Impoundment #7	55.4	Garrett, Md.	--
Broad Ford Run	SCS Impoundment #6	143	Garrett	--
Broad Ford Run	Mountain Lake	11.0	Garrett	130-580
Unnamed Tributary	SCS Impoundment #5	62.7	Garrett	--
Wilson Run	SCS Impoundment #3	19.5	Garrett	--
Cherry Glade Run	SCS Impoundment #2	14.3	Garrett	--
Cherry Glade Run	SCS Impoundment #1	18.8	Garrett	--
Little Youghiogheny R.	Southern High Pond	1.0	Garrett	125-581
Herrington Creek	Lake Koshare	17.6	Garrett	104-601
Herrington Creek	Herrington Lake	44.0	Garrett	106-600
Muddy Creek	Browning Dam		Garrett	103-623
Deep Creek	Deep Creek Lake	3,900.0	Garrett	126-619
Bear Creek	Accident Comm. Pond	1.0	Garrett	148-665
Youghiogheny River	Youghiogheny Reservoir	800.0	Garrett & Fayette & Somerset, Pa.	
Casselman River				
North Branch Casselman	Cunningham Lake (Pleasant Valley)	18.0	Garrett	167-637
Piney Creek	Frostburg Reservoir	18	Garrett	236-688
Whites Creek				
Puzzley Run	Lake Louise		Garrett	173-683

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* Source: 1961 Maryland Impoundments Inventory, Department of Game and Inland Fish; and *Little Youghiogheny Watershed Report*, Soil Conservation Service, 1954.

APPENDIX D

STORAGE REQUIREMENTS FOR SUSTAINED YIELDS

See Description of Appendices (Appendix D) in the General Reference Section for a narrative discussion of this material.

APPENDIX D

Storage Requirements for Sustained Yields

The following table lists the artificial requirements, computed as outlined in the Description of Appendices, General Reference Section for streams in the Maryland portion of the Monongahela River sub-basin.

The storage values are given in terms of mean annual flow, but can be converted easily into volumes by use of the relation:

$$\frac{V_s}{M} = R_s$$

in which

V_s = volume of storage required;

M = mean annual flow, in acre-feet; and

R_s = storage ratio (from table)

For example the following table gives a storage ratio of 0.240 for a gross yield of 0.5 M on the Casselman River at Grantsville, Maryland.

Mean flow = 115 cfs (from column 3)

$$M = 115 \text{ ft.}^3 \text{ x sec.}^{-1} \text{ x } \frac{1.98 \text{ acre-feet x day}^{-1}}{\text{ft.}^3 \text{ x sec.}^{-1}} \text{ x } 365 \text{ days}$$

$$M = 115 \text{ x } 1.98 \text{ x } 365 \text{ acre-feet}$$

$$V_s = R_s M = 0.240 \text{ x } 115 \text{ x } 1.98 \text{ x } 365 \text{ acre-feet}$$

$$V_s = 20{,}000 \text{ acre-feet}$$

This means that a reservoir holding 20,000 acre-feet of water on the Casselman River above the stream gage at Grantsville would provide a gross yield of 57.5 cfs (equal to 115 cfs times 0.5) for 19 out of every 20 years, on the average. Except for seepage, evaporation losses, and diversions, this flow would be sustained at the gage.

APPENDIX D

Table D-1

Storage Requirements for Various Gross Yields[a]

OHIO RIVER BASIN--Monogahela River Sub-basin

Recurrence Interval = 20 years

					Storage in terms of mean annual flow for various yields			
					Yield in Terms of Mean Annual Flow			
Stream and Gaging Station (1)	Drainage area, sq. miles (2)	Mean annual flow, cfs (3)	Coeff. of Variation (4)	Natural Storage Constant, days (5)	0.3 (6)	0.5 (7)	0.7 (8)	0.9 (9)
Youghiogheny River near Oakland, Md.[b]	134	286	0.23	--	0.111	--	--	--
Youghiogheny River at Friendsville, Md.[c]	295	647	0.21	--	0.048	--	--	--
Casselman River at Grantsville, Md.[b]	62.5	115	0.16	0	0.117	0.240	--	--

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a Gross yield includes evaporation losses and seepage losses.

b Unregulated.

c Low and medium flow regulated since 1925 by Deep Creek Reservoir.

Prepared by C.H.J. Hull, October 12, 1963

APPENDIX E

SURFACE WATER PERMITS

See Description of Appendices (Appendix E) in the General Reference Section for a narrative discussion of this material.

OMITTED IN THIS REPORT - NO SURFACE WATER
PERMITS ISSUED IN YOUGHIOGHENY RIVER
BASIN.

APPENDIX F

GROUND WATER PERMITS

See Description of Appendices (Appendix F) in the General Reference Section for a narrative discussion of this material.

APPENDIX F
GROUND WATER APPROPRIATION PERMITS IN GARRETT COUNTY

(appropriations of 10,000 gallons per day or more*)

Permit Holder Name and Address (1)	Water Use (2)	Date of Issue (3)	Appropriation Average (4)	Permitted Maximum (5)
City Water Co. Friendsville, Md.	Public water supply	Aug. 22, 1960	10,000	15,000
Garrett Co. Coop., Inc. Grantsville, Maryland	General canning	May 26, 1947	15,000	75,000
Grantsville Dairy, Inc. Grantsville, Maryland	Dairy use	Mar. 26, 1946	13,500	
Johnstown Coal & Coke Co. Vindex, Maryland	Household use & supply locomotive boiler	Oct. 23, 1945	26,000	50,000
Sterling Processing Corp. Oakland, Maryland	Processing of poultry	Sept. 21, 1956	50,000	200 gpm **
Sterling Processing Corp. Oakland, Maryland	Sanitary facilities & process industrial water	Sept. 28, 1965	300,000	400,000
Union Fire Brick Co. Grantsville, Maryland	Operation of plant	July 18, 1952	12,000	20,000
Yoder, Eli Box 73, Grantsville, Md.	For locker & refrigeration plant	June 24, 1947	33,000	70 gpm**

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* In addition to permits listed, there are 76 permits outstanding for appropriations in Garrett County under 10,000 gallons per day. Those appropriations total 76,625 gallons per day.

** gallons per minute

APPENDIX G

INDUSTRIAL WATER USERS SUPPLIED BY PUBLIC WATER SYSTEM, CITY OF BALTIMORE, MARYLAND

(OMITTED IN THIS REPORT - APPLICABLE ONLY TO CHESAPEAKE BAY WEST REPORT)

APPENDIX H

ABSTRACTS OF PUBLISHED REPORTS ON GROUND-WATER RESOURCES

See Description of Appendices (Appendix H) in the General Reference Section for a narrative discussion of this material.

APPENDIX H

THE GROUND-WATER RESOURCES OF GARRETT COUNTY

by

Robert M. Overbeck

- Summary and Conclusions -

The yields, specific capacities, and depths of the wells ending in the different water-bearing formations in Garrett County show no significant differences. One reason may be that many domestic wells are not tested at their maximum capacity because the additional water is not needed. Conversely, where a large supply is needed and several wells are drilled into a particular formation and tested to their maximum capacity to obtain the required supply, the apparent average yield for wells tapping that formation may be above that for other formations tapped by only domestic wells. Nevertheless, the yields, specific capacities, and depths summarized in Table 19 provide a fair guide to the water-yielding potential of the formations, except the Monongahela formation and the Quaternary deposits.

The most favorable places for the development of large ground-water supplies are in the synclinal coal basins where the Allegheny and Pottsville formations may be penetrated by drilling to moderate depths. The presence of coarse-grained, massive or fractured permeable sandstones within these formations probably explains the relatively high yields obtained from some wells ending in them. The yields of 18 wells average more than 26 gallons a minute, and yields in excess of 200 gallons per minute have been reported from a few wells. However, where these strata lie at considerable depth the water may be of poor quality and unsuitable for use without dilution or treatment.

The records of 57 wells ending in the Jennings formation show this formation is one of the poorest aquifers in Garrett County. The average yield of the wells tapping it is only 10 gallons a minute, and the yield per foot of drawdown is only 0.4 gallon a minute. The average yield per foot of well drilled is 0.08 gallon a minute, whereas in the Allegheny and Pottsville formations it is 0.3 gallons a minute.

Springs are important sources of domestic and municipal ground-water supplies in Garrett County. The springs are mostly gravity springs which issue from the lower part of permeable strata where they are underlain by less permeable strata along the sides of valleys and draws. The flow of the springs is variable, but most of those inventoried flowed less than 10 gallons a minute at the time of measurement. The largest springs provide the public water supply of the towns of Grantsville, Friendsville, Mountain Lake Park, and Loch Lynn Heights. A part of the municipal supply of Oakland is obtained from a spring.

In general, the quality of the ground water in Garrett County is satisfactory for most uses. In some wells, however, the iron content of the water is sufficiently high to make treatment for iron removal desirable. Field and laboratory analyses show that the iron content of well water ranges from 0.5 to 10 parts per million. The iron content of spring water is commonly lower, although the number of analyses of iron in spring water is limited. The hardness of ground water from wells and springs in Garrett County ranges from 10 to 170 parts per million. The average hardness of 16 samples, from both wells and springs, is 55 parts per million as $CaCO_3$. Water of this degree of hardness is generally regarded as soft.

The measured temperature of well and spring water ranged from 48°F. to 62°F. and averaged approximately 53°F. No direct relationship between the

temperature of well water and the depth of the well was established by the temperature measurements.

Source: Overbeck, Robert M. 1954. Ground Water Resources. in Geology and Water Resources of Garrett County. Department of Geology, Mines and Water Resources. Bulletin 13. 349 pp.

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